NOAA NESDIS CENTRAL SATELLITE DATA PROCESSING CENTER



Microwave Humidity Sounder (MHS) Level 1b Format Specification for NOAA-N and the IJPS Era

Version 1.4

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Table of Contents

1	Int	troduction	1
2	Ap	oplicable Documents	1
3	Ins	strument Modes	1
4	Da	ta Record Types	2
5	Da	ta Representation and Storage	3
	5.1	Bit Numbering	3
	<i>5.2</i>	Signed Integers	3
	5.3	Unsigned Integers	4
	5.4	Scaled Integers	5
	5.5	Byte Ordering	5
6	M	HS Level 1b Format Specifications	6
	6.1	MHS 1b Primary Header Record Format	7
	6.2	MHS 1b Data Record Format (Science Packet)	15
	6.3	MHS 1b Data Record Format (Extended Test Data Packet)	25
	6.4	MHS 1b Data Record Format (Extended Memory Data Packet)	<i>28</i>
	6.5	MHS 1b Data Record Format ("Unknown" Packet)	31
7	TE	BCs/TBDs	34
8	No	otes	34
9	Ac	eronyms	36

1 Introduction

This document describes the MHS Level 1b format for the IJPS era, which includes the NOAA-N/N' satellites and the Metop satellites. It provides Level 1b format specifications for the primary header record and the three types of data records. Please note that as part of the updates to the Level 1b formats for NOAA-N and the IJPS era is the inclusion of additional, or secondary, header records. They will contain ancillary data set names and any metadata needed for, primarily, reprocessing. Currently, the content and format of any secondary header record is TBD. Applications that will access MHS Level 1b data sets should use the "Count of Header Records in this Data Set" field, located in the first, or primary, header record, to calculate the position of the first data record and skip the secondary header records.

Although the MHS is a new instrument, it shares some commonality with the AMSU-B instrument. Therefore, similarities with the AMSU-B Level 1b format were maintained as much as possible. For example, a number of MHS Level 1b fields that are similar to AMSU-B Level 1b fields (e.g., calibration coefficients, earth location data, earth FOV counts) have the same byte offsets as their corresponding AMSU-B fields. Also, based on the format given in this document, the MHS Level 1b record length is 3,072 bytes, which is the same as the AMSU-B Level 1b record length. However, in addition to some obvious telemetry differences, nomenclature used by the instrument manufacturer in MHS documentation is used in this document for consistency. For example, the channels are referred to as H1, H2, H3, H4, and H5, as opposed to 16, 17, 18, 19, and 20, respectively, as is the case for AMSU-B.

2 Applicable Documents

Table 1 presents a list of applicable documents (AD-#).

Doc#	Title	Reference Number	Issue	Date
AD-1	MHS TM-TC and Science	MHS-TN-JA063-MMP	7	January 2004
	Data Format Directory			
AD-2	MHS Instrument ICD	MO-IC-MMT-MH-0001	5	July 2001
AD-3	MHS Calibration Algorithm	NOAA Technical Report	Ver. 3	August 2003
		(unpublished)		

Table 1 - Applicable Documents

3 Instrument Modes

The MHS instrument, and its associated interface unit (the MIU) on the NOAA satellites, can operate in a variety of different modes and output several different packets, or formats, of data. The MHS Level 1b format given in this document is applicable for any mode of the MHS instrument and for the "nominal" modes of the MHS Interface Unit (MIU)--i.e., the modes in which the MIU passes through its received MHS data without replacement with its own telemetry data. The MHS Level 1b data will not contain any MIU telemetry. (NOTE: The MIU is a NOAA-specific piece of hardware. There will be no MIU on the Metop satellites. Therefore, references to the MIU, and how it affects the data stream, are only applicable to the MHS data from the NOAA satellites.)

Table 2 shows the nine MHS modes in which packet data is output and the three types of packets that are output in these modes.

MHS Mode	MHS Output						
Power-on	Empty Science Data Packet						
Warm-up	Empty Science Data Packet						
Standby	Empty Science Data Packet						
Scan	Science Data Packet						
Fixed View	Science Data Packet						
Self-test	Extended Test Data Packet						
Safeing	Empty Science Data Packet						
Fault	Empty Science Data Packet						
Memory Dump	Extended Memory Data Packet						

Table 2 - MHS Modes and Output

An empty science data packet has the same format as the science data packet. However, except for the initial 39 bytes of housekeeping data, the packet is empty--i.e., zero filled. In fixed view mode, the instrument is not scanning, but is set, or fixed, at one view position. Therefore all of its normal views of earth, space, and the on-board calibration target (OBCT) are of this fixed view position instead. When an empty science data packet is received or when the instrument is in fixed view mode, calibration is unable to be performed. Therefore, scans generated in either of these two situations are marked as unusable.

Technically, memory dump mode is not an actual mode of the MHS. Instead, the MHS can be commanded to perform a memory dump during most of its modes. The extended memory data packet generated during a memory dump supersedes the packet normally output during that particular mode. For the sake of simplicity, this document treats memory dump mode as a unique MHS mode.

4 Data Record Types

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According to Table 2, when MHS is in "self-test" mode or "memory dump" mode, it will output an extended test data packet or extended memory dump packet, respectively. In all other modes, including "scan" mode, it will output a (possibly empty) science data packet. The instrument will normally be in "scan" mode. In addition there may be times in which the type of MHS packet can not be determined. For example, the mode code, which identifies the type of packet, in the data stream may be missing. For the NOAA satellites, this is possible if the minor frame containing the mode code is missing. Also, the mode code may be corrupt, and set to one of the "unused" values. In a case in which the packet type can not be determined, it is classified as an "unknown" packet. Each different type of packet output by MHS, and including the "unknown" packet type, results in a different type of data record output to the MHS Level 1b data set. This document provides Level 1b format specifications for all four types of data records. However, no matter the type of data record, they all share the same basic three-part organization: a header section, a packet data section, and a trailer section. The format of the header and trailer sections are identical across the three types of data records. The header section is composed of the first 29 bytes of the data record, which comprise the fields "Scan Line Number" through "Scan Line

Quality Flags [Time Problem Code]", inclusively. The trailer section is composed of the last 238 bytes of the data record, which begins with the field "Main Bus Select Status" and continues through the "<Zero Fill>" padding at end of record. The content and format of the packet data section varies depending on the type of data record. In all cases though, the actual data from the particular MHS packet within this section begins at the same byte offset (1481). Additionally, in the case of data records containing either extended test data packets or extended memory data packets, the packet data is inserted exactly as received from the spacecraft without modification. (Some of the data in a science packet is slightly re-ordered--to align with common fields of the AMSU-B Level 1b data record--with a few additional fields inserted.)

As mentioned in Section 3, an empty science data packet and a science data packet have the same format. The difference is that most of the content of an empty science data packet is, as its name implies, empty. In terms of a Level 1b data record containing an empty science data packet, the following fields are zero filled (empty):

- "Scene (Earth View) Data" (bytes 1481-2560) through "OBCT View Position Validity Flags" (bytes 2686-2686)
- "Status Word" (byte 2727) through "Science Packet Spare Words" (bytes 2789-2833)

However, an empty science data packet does contain valid housekeeping data. So, in a data record containing an empty science data packet, the "Mode and Sub-commutation Code" field (byte 2687) through the "Raw Current Consumption Data" field (bytes 2720-2725) contain valid data.

5 Data Representation and Storage

This section describes the bit and byte numbering conventions used in this document, and the storage methods for integers and floating point numbers. This information is especially critical when transporting data from one computer architecture to another. Without special handling, data produced on one system may be unusable on another due to differences in internal data storage.

5.1 Bit Numbering

A byte in this document is defined as containing 8 bits. A word is 8, 16, or 32 bits in length. In all cases, the least significant bit (lsb) is designated as bit 0 and has a base-10 value of $2^0 = 1$. Therefore, in an 8-bit word the most significant bit (msb) is designated as bit 7, and has a base-10 value of $2^7 = 128$. In a 16-bit word the msb is designated as bit 15, and has a base-10 value of $2^{15} = 32,768$. In a 32-bit word the msb is designated as bit 31, and has a base-10 value of $2^{15} = 32,768$.

5.2 Signed Integers

For signed binary integers, the msb represents the sign of the number. The remaining bits (bits 6 through 0 for 8-bit words, 14 through 0 for 16-bit words, and 30 through 0 for 32-bit words) are used to designate the magnitude of the number. Therefore, the range of signed binary integers is based on word size as follows:

- 1 byte -128 to 127
- 2 bytes -32,768 to 32,767

• 4 bytes -2,147,483,648 to 2,147,483,647

Positive binary integers are in true binary notation with the sign bit set to zero. Negative binary integers are in two's-complement notation with the sign bit set to one. Negative binary integers are formed in two's-complement notation by inverting each bit of the positive binary integer and adding one.

5.3 Unsigned Integers

Unsigned binary integers use all bits including the msb to represent the magnitude of the number. Therefore, their range is as follows, again, based on word size:

1 byte 0 to 255
2 bytes 0 to 65,535
4 bytes 0 to 4,294,967,295

A field containing a binary integer is given the data type of unsigned integer if its content will never be negative or if a negative value just does not make sense for that field. For example, the idea of a negative scan line number or negative date or time is nonsensical. Therefore, fields containing scan line numbers, dates, and times are labeled as unsigned integers.

Unfortunately, this data type is not supported by all computer languages (e.g., Fortran), so additional data manipulation may be necessary. In the case of reading a 16-bit unsigned integer (DATA), a Fortran user could use the following code snippet to extract the actual value (VALUE):

```
INTEGER*2 DATA
INTEGER*4 VALUE
...
READ DATA
IF (DATA .LT. 0) THEN
VALUE = 65536 + DATA
ELSE
VALUE = DATA
ENDIF
```

But note that nearly all unsigned integer fields can be safely read into signed integer data types of the same word sizes. This is because they were originally written to the 1b using signed integer data types, and thus will be within the positive range of the corresponding signed integer data type (see Section 5.2). The 1b format specifications will clearly indicate, by providing ranges, those unsigned integer fields that must be strictly treated as unsigned integer data typesusing the data manipulation described above, if necessary—to ensure that correct values are retrieved.

However, not all fields of an unsigned integer data type contain unsigned binary integers. Fields containing packed data are also identified as unsigned integers. While its msb is not a sign bit, a

field containing packed data does not represent an unsigned binary integer. Such a field requires the user to perform some type of special unpacking technique in order to extract the information of interest from the field in order for it to be interpreted correctly. Packed data may be bit fields, packed integers, or both. A bit field is one or more consecutive bits used to indicate one of two or more possible conditions or states. (A bit flag is a specialized instance of a bit field. It is a single bit indicating one of only two possible conditions.) For example, a three-bit field may indicate which of seven different modes that an instrument is operating in (i.e., 0 implies "power on mode", 1 implies "warm up mode", 2 implies "standby mode", etc.). A packed integer is simply a binary number that is stored in just a subset of an unsigned integer field's bits. Although similar to a bit field, a packed integer is not an indicator of a condition, but an actual numeric value having magnitude that, once unpacked, could be used in arithmetic computations.

5.4 Scaled Integers

To provide maximum portability of the Level 1b data sets across different computer platforms, floating point data is represented by scaled integers. Scaled integers can be either signed or unsigned, and are simply floating point numbers multiplied by a fixed scaling factor so that a sufficiently precise representation of the original number can be stored in integer form. For example, the floating point value 1.2313 might be multiplied by 10^2 to achieve an integer value of 123. To achieve better precision, the floating point value might be multiplied by 10^3 or 10^4 to achieve an integer value of 1231 or 12313, respectively. In the Level 1b data sets, the scaling factors are powers of ten, and only the exponents (2, 3, and 4 in the previous examples) are documented within the data set. To recover an approximation of the original floating point value, divide the integer value by ten raised to the given exponent.

5.5 Byte Ordering

A major problem impeding the free transport of binary data from one computer system to another is the "Big Endian - Little Endian" dichotomy. *Big Endian* systems (e.g. IBM 370, Macintosh, SGI, Sun SPARC) store bytes of binary numeric data in reverse order relative to *Little Endian* systems (e.g. IBM PC, DEC Alpha). For example, a 32-bit hexadecimal value of x01020304 (decimal value 16,909,060) written to a binary file by a Big Endian system would be read from the file as x04030201 (decimal value 67,305,985) by a Little Endian system. Level 1b data sets generated and archived by NOAA are in Big Endian order; users with Little Endian systems must include an additional byte-swapping step when reading binary numeric data from Level 1b data sets produced by NOAA. Some processors support byte swapping in their instruction sets, but others must use compiler-dependent functions.

6 MHS Level 1b Format Specifications

The format specifications for the MHS Level 1b header record and the three types of MHS Level 1b data records are given in this section. The meaning of each column in the format specifications is defined in Table 3.

Name	Description
Field Name	The name or brief description of the field.
Start Octet	Offset location of first octet in the defined field from beginning of record, starting with octet 1. (Note that the terms "octet" and "byte" are used interchangeably and mean the same thing.)
End Octet	Offset location of last octet in the defined field from beginning of record.
Data Type	Data Type (i - integer, u - unsigned integer, c - character). Character data is stored as ASCII.
Word Size	Number of octets per data word.
Number of Words	Number of words of indicated size and type contained in the defined field.
Scale Factor	Scaling Factor.
Units	The field's unit of measurement (e.g., octets, counts, Kelvin, volts), if applicable.
Notes	References to notes that follow the format specifications in Section 8.

Table 3 - Description of Format Specification Columns

6.1 MHS 1b Primary Header Record Format

	T =-			T				
	Start				Number	Scale	W.T	Nindan
Field Name	Octet	Octet	Type	Size	of Words	Factor	Units	Notes
FILE IDENTIFICATION				ļ		L		+
Data Set Creation Site ID	1	3	С	3	1	U		1
CMS=Centre de Meteorologie Spatiale/France DSS=Dundee Satellite Receiving Station/UK								
NSS=National Environmental Satellite, Data and Information								
Service/USA								
UKM=United Kingdom Meteorological Office/UK								
<ascii blank="x20"></ascii>	4		<u> </u>	1		0		<u> </u>
Level 1b Format Version Number	5	6		2		0		 _
Level 1b Format Version Year (four digits, e.g., 2000)	7	8		2		0		
Level 1b Format Version Day of Year (e.g., 365)	9			2	1	0		<u> </u>
Reserved for Logical Record Length> (For Creation Site use	11	12	u	2	1	0	octets	
only. Logical Record Length of source 1b data set prior to		Ì						1
processing.)								
Reserved for Block Size> (For Creation Site use only. Block	13	14	u	2	1	0	octets	
Size of source 1b data set prior to processing.)						<u> </u>		
Count of Header Records in this Data Set	15			2		0		
<zero fill=""></zero>	17	22	i	2		C		
Data Set Name	23	64	С	42	1	C		
Processing Block Identification	65	72	С	8	1	C		
Spacecraft Identification Code	73	74	u	2	1	C		
7=NOAA-N	ļ			1			1	İ
8=NOAA-N'							[
1=Metop-1 (TBC)								
2=Metop-2 (TBC) Instrument ID	75	76	u	1 2	1	1		+
0=proto-flight model (PFM) (NOAA-N)	1 "	1 ~	1 "	1	1 .	1	1	
2=FM2 (NOAA-N')	ŀ							
3=FM3 (Metop-2)		ļ					ļ	İ
4=FM4 (Metop-1)								
5=FM5 (Metop-3)	77	78		2	- 1			
Data Type Code	''	۱ /°	u	1	1 '	1	1	
12=MHS	79	80	 	1 2	1	-		+
TIP Source Code (NOAA: values defined below) or	/ '>	7 %	u	4	1	1	1	
<pre><zero fill=""> (Metop)</zero></pre>								
0=unused, i.e., GAC/HRPT/LAC data 1=GAC-embedded AMSU and TIP		ł						
2=stored TIP (STIP)								
3=HRPT/LAC-embedded AMSU and TIP				ļ		1		
4=stored AIP (SAIP)		ļ .		<u> </u>				
Start of Data Set Day Count starting from 0 at 00h, 1 Jan 1950	81			1				4
Start of Data Set Year (four digits, e.g., 2000)	85			1 2		(
Start of Data Set Day of Year (e.g., 365)	87			1 2	2 1	(4
Start of Data Set UTC Time of Day	89			4	· · ·	†	milliseconds	4
End of Data Set Day Count starting from 0 at 00h, 1 Jan 1950	93			4	}	(4
End of Data Set Year (four digits, e.g., 2000)	97				2 1	(
End of Data Set Day of Year (e.g., 365)	99			1 2	2 1	l (
End of Data Set UTC Time of Day	101			4		1	milliseconds	
Year of Last CPIDS Update (four digits, e.g., 2000)	105				2 1	1		
Day of Year of Last CPIDS Update (e.g., 365)	107	108	3 u		2 1	1 (
Offset between Start of Scan and Center of First FOV	109	110	i			1 (milliseconds	
Zero Fill>	111	120) i		2 5	5 ()	

	Start	End	Data	Word	Number	Scale		$\overline{}$	l
Field Name					of Words		Units	Notes	l
DATA SET QUALITY INDICATORS							-		
Instrument Status (These are bit flags taken from "Mode and	121	124	u	4	1	0			
Sub-commutation Code" field and "Switch Status" field on first									l
data record for which all of the individual status flags have	;							ŀ	l
been reported at least once.)								1	l
bits 31-28: mode code (0=power on; 1=warm up; 2=stand by; 3=scan;									l
4=fixed view; 5=self test; 6=safeing; 7=fault; 8-14= <unused>; 15=memory data packet ID)</unused>									İ
bit 27: PIE ID (0=PIE A; 1=PIE B)]								
bits 26-24: sub-commutation code (only meaningful for telemetry]							1	İ
packet data)		·							1
bit 23: receiver channel H4 backend (0=off; 1=on) bit 22: receiver channel H3 backend (0=off; 1=on)		ļ							
bit 21: receiver channel H3/H4 local oscillator selected (0=A; 1=B)	1								١
bit 20: receiver channel H3/H4 front-end (0=off; 1=on)	1			:					
bit 19: receiver channel H2 local oscillator selected (0=A; 1=B)									
bit 18: receiver channel H2 (0=off; 1=on) bit 17: receiver channel H1 local oscillator selected (0=A; 1=B)	1								
bit 16: receiver channel H1 (0=off; 1=on)				į					
bit 15: PROM (1=a PROM segment switch has failed ON)									
bit 14: signal processing electronics/scan control electronics (0=off;						i			
1=on)									
bit 13: auxiliary operational heaters (0=off; 1=on) bit 12: scan mechanism operational heaters (0=off; 1=on)								1	
bit 11: receiver operational heaters (0=off; 1=on)									
bit 10: Rx CV (0=off; 1=on)								1	
bit 9: receiver channel H5 local oscillator selected (0=A; 1=B)									
bit 8: receiver channel H5 (0=off; 1=on) bit 7: FDM motor current trip status (0=enabled; 1=disabled)								1	
bit 6: RDM motor current trip status (0=enabled; 1=disabled)								1	
bit 5: FDM motor supply (0=off; 1=on)									
bit 4: RDM motor supply (0=off; 1=on)	l							(
bit 3: FDM motor sensors selected (0=A; 1=B) bit 2: RDM motor sensors selected (0=A; 1=B)						l i			Γ
bit 1: FDM zero position sensors (0=A; 1=B)	· '		ŀ					1	
bit 0: RDM zero position sensors (0=A; 1=B)									
<zero fill=""></zero>	125			2	1	0			
Record Number of Status Change (if 0, none occurred)	127			2	1	0			
Second Instrument Status (if previous word is 0, no change)	129			4	1	0			
Count of Data Records in this Data Set	133			2	1	0		<u> </u>	
Count of Calibrated, Earth Located Scan Lines in this Data Set	135			2	1	0		<u> </u>	1
Count of Missing Scan Lines	137			2	1	0		<u> </u>	
Count of Data Gaps in this Data Set (NOTE: Gaps are due to	139	140	u] 2	1	0			
either actual lost data, such as during transmissions, or				1					
ignored data when the instrument science data is superceded						•			
by other telemetry data during non-nominal modes of the TIP									
or MIU.)					ļ			_	1
Count of Scans Containing Lunar-Contaminated Space Views	141	142	i	2	1	0			1
(Also, see bits 1 and 0 of Word 1 of "Scan Line Quality Flags									
[Calibration Problem Code]" field in data record.) -1=the detection algorithm for lunar contamination is turned off									
0=the detection algorithm is turned on: no scans containing lunar-									
contaminated space views were found					ļ				
>0=the detection algorithm is turned on: the value in this field			1					1	
represents the number of scans found that contain lunar-contaminated									
Space views Count of Data Frames Without Frame Same Word Frame	142	1 4 4		 		 		 	1
Count of Data Frames Without Frame Sync Word Errors (NOAA) or	143	144	u	2	1	0			
<pre>(NOAA) or <zero fill=""> (Metop)</zero></pre>									
Count of PACS Detected TIP Parity Errors (NOAA) or	145	1 / 4	 	 	1	0			
Count of PACS Detected TIP Parity Effors (NOAA) or <zero fill=""> (Metop)</zero>	143	146	u	2	1 '	9			
ZOTO I III (MEIUP)		L		l	L	L l	L	l	1

m of All Auxiliary Sync Errors Detected in the Input Data CAN) or CATOR FILD Metopy Time Sequence Error Check Option Time Sequence Error Code (These are bit flags taken from Sean Line Sequence Error Fold above. If a bit is on (=1) then the statement is true.) It is 150 u 2 u 3 u 4 u 2 u 4 u 5 u 6 u 6 u 7 u 6 u 7 u 7 u 7 u 7						Number	Scale	TT 14.	N
CACTO FILE Metop) Time Sequence Error Code (These are bit flags taken from "Con Line Quality Flags Time Sequence Error Code (These are bit flags taken from "Con Line Quality Flags Time Sequence Error Floor Code (These are bit flags taken from "Con Line Quality Flags Time Problem Code) on data record reported in "Time Sequence Error "field above. If a bit is on (~1) then the statement is true.) bits 15-5: czero flip bit 15					Size	or words	Factor	Units	Notes
EZERT FIIID (Meterp)		14/	148	u	2	1	Y		
Time Sequence Error Denone; otherwise, the record number of the first occurrence Time Sequence Error Code (These are bit flags taken from "Scan Line Quality Flags (Time Problem Code)" on data record reported in "Time Sequence Error" field above. If a bit is on (=) I then the statement is true.) bit 5: this record starts a sequence that is inconsistent with previous good time bit 5: this record starts a sequence that is inconsistent with previous good time bit 5: this record starts a sequence that is inconsistent with previous times (i.e., there is a time discontinuity); may be associated with a spacecraft doct update bit 4: start of a sequence that paperently repeats scan times that have bit 3: 3-9: care to 1930 SOCI Clock Update Indicator □-none during this orbit; otherwise, the record number of the first scourrence Earth Location Error Code (These are bit flags taken from □-rone during this orbit; otherwise, the record number of the first scourrence Earth Location Error Code (These are bit flags taken from closer flags is an incompleted in "Earth Location Problem Code)" on data record reported in "Earth Location Error Indicator" flag ove. If a bit is on (=1) then the statement is true.) bit 1: not earth location questionable time code bit 5: earth location questionable time code bit 5: earth location questionable time code bit 6: earth location questionable time code bit 6: earth location questionable time code bit 7: not earth located because of satellite out-of-plane maneuver (Metop) or zero fility (NOAA) bit 1: not earth location (Proverse playback, time decrementing) bit 1: tipe direction (One-were playback, time decrementing) bit 1: tipe direction (One-were playback, time decrementing) bit 1: tipe direction (One-were playback, time decrementing) cove. If a bit (ONAA) PACS Status Bit Field (VOAA: value defined below) or -Caro Fility (OAA) sequence (One-mail data; 1-pseudonoise data) bit 1: tipe direction (One-were playback, time decrementing) cover direction (One-were playback, time decrementing) bi	Tr contract the contract to th	1							
Denone; otherwise, the record number of the first occurrence Time Sequence Error Code (Free are bit flags taken from "Scan Line Quality Flags (Time Problem Code)" on data record reported in "Time Sequence Error' field above. If a bit is 15% - caro fills bit 15%		1/0	150	11		1			+
Time Sequence Error Code (These are bit flags taken from "200n Line Quality Flags (Time Prohibin Code)" on data record reported in "Time Sequence Error" field above. If a bit is 15°C. and the sequence Error" field above. If a bit is 15°C. and the sequence Error" field above. If a bit is 15°C. and the sequence Error" field above. If a bit is 15°C. and the sequence Error field above. If a bit is 15°C. and the sequence Error field above. If a bit is 15°C. and the sequence is 10°C. and 10°C.		149	150	u	4	1			
"Scan Line Quality Flags (Time Problem Code)" on data record reported in "Time Sequence Error" field above. If a bit is on (=1) then the statement is true.) bits 15-8: -caren fill> bit 7: time field is bad and can't be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 6: time field is a sequence that apparently repeats scan times that have been eviously accepted. SOCC Clock Update Indicator 9-none during this orbit, otherwise, the record number of the first coursence. Earth Location Error Indicator is coursence. Earth Location Error Indicator is coursence. Earth Location Error Code (These are bit flags taken from "Scan Line Quality Flags [Earth Location Problem Code]" on latar record reported in "Earth Location Error Indicator" field you. If a bit so n (=1) then the statement is true.) SIS 5: SIS 15: Caren fills. SIS 5: SIS 15: Caren fills. SIS 5:		151	152	11	2	1			+
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Backup Reference Temperature (from QBS1), Minimum 205 206 2 1 2K		203	204	i	2	1	2	K	
Backup Reference Temperature (from QBS1), Nominal 207 208 i 2 1 2K		205	206	i	2	1	2	K	
Backup Reference Temperature (from QBS1), Maximum		207	208	i	2	1	2	K	
Ch. H1 Warm Load Correction Factor (maximum temperature) 213 214 1 2 1 3K		209	210	i	2	1	2	K	
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	LO A Ch. H5 Nonlinearity Coefficient (minimum temperature)		+	-					

	Start	End	Data	Word	Number	Scale	<u> </u>	Γ
Field Name					of Words	Factor	Units	Notes
O A Ch. H5 Nonlinearity Coefficient (nominal temperature)	333	336		4	1	8	m ² -sr-cm ⁻¹ /mW	
20 A Ch. H5 Nonlinearity Coefficient (maximum temperature)	337	340	i	4	1		m ² -sr-cm ⁻¹ /mW	
LO B Ch. H1 Nonlinearity Coefficient (minimum temperature)	341	344	i	4	1		m ² -sr-cm ⁻¹ /mW	
LO B Ch. H1 Nonlinearity Coefficient (nominal temperature)	345	348	i	4	1		m²-sr-cm ⁻¹ /mW	
LO B Ch. H1 Nonlinearity Coefficient (maximum temperature)	349	352	i	4	1		m²-sr-cm ⁻¹ /mW	
LO B Ch. H2 Nonlinearity Coefficient (minimum temperature)	353	356	i	4	1		m ² -sr-cm ⁻¹ /mW	
LO B Ch. H2 Nonlinearity Coefficient (nominal temperature)	357	360	i	4	1		m ² -sr-cm ⁻¹ /mW	
LO B Ch. H2 Nonlinearity Coefficient (maximum temperature)	361	364		4	1		m ² -sr-cm ⁻¹ /mW	
LO B Ch. H3 Nonlinearity Coefficient (minimum temperature)	365	368		4	1		m ² -sr-cm ⁻¹ /mW	<u> </u>
LO B Ch. H3 Nonlinearity Coefficient (nominal temperature)	369	372		4			m ² -sr-cm ⁻¹ /mW	
LO B Ch. H3 Nonlinearity Coefficient (maximum temperature)	373	376		4			m ² -sr-cm ⁻¹ /mW	
LO B Ch. H4 Nonlinearity Coefficient (minimum temperature)	377	380		4			m ² -sr-cm ⁻¹ /mW	
LO B Ch. H4 Nonlinearity Coefficient (nominal temperature)	381	384		4	1		m ² -sr-cm ⁻¹ /mW	
LO B Ch. H4 Nonlinearity Coefficient (maximum temperature)				4	1		m ² -sr-cm ⁻¹ /mW	
LO B Ch. H5 Nonlinearity Coefficient (minimum temperature)	389			4	1		m ² -sr-cm ⁻¹ /mW	
LO B Ch. H5 Nonlinearity Coefficient (nominal temperature)	393			4	1		m ² -sr-cm ⁻¹ /mW	ļ
LO B Ch. H5 Nonlinearity Coefficient (maximum temperature)	397	400		4	1	8	m ² -sr-cm ⁻¹ /mW	
<zero fill=""></zero>	401	416	i	4	4	0		
TEMPERATURE-RADIANCE CONVERSION			<u>.</u>	<u> </u>				ļ
Temperature-radiance Ch H1 Central Wavenumber	417	420		4			cm ⁻¹	
Temperature-radiance Ch H1 Constant 1	421	424		4		. 6		
Temperature-radiance Ch H1 Constant 2	425			4		. 6		ļ
Temperature-radiance Ch H2 Central Wavenumber	429			4			cm ⁻¹	ļ
Temperature-radiance Ch H2 Constant 1	433	436		4		. 6		
Temperature-radiance Ch H2 Constant 2	437	440		4		6	cm ⁻¹	
Temperature-radiance Ch H3 Central Wavenumber	441	444		4				
emperature-radiance Ch H3 Constant 1	445			4		. 6		ļ .—
Temperature-radiance Ch H3 Constant 2	449			4	ļ		cm ⁻¹	-
Temperature-radiance Ch H4 Central Wavenumber	453			4				
Temperature-radiance Ch H4 Constant 1	457			4	ļ	. 6		
Temperature-radiance Ch H4 Constant 2	461		No.	4			cm ⁻¹	<u> </u>
Temperature-radiance Ch H5 Central Wavenumber	465		1	4				
Temperature-radiance Ch H5 Constant 1	469			4		1 6		
Temperature-radiance Ch H5 Constant 2	473 477			4				
<zero fill=""></zero>	4//	492	1	-	 	, ·		
NAVIGATION	493	500	C	5	1	1 (
Reference Ellipsoid Model ID (The ellipsoid is a mathematically tractable approximation of the geoid, which is	493	300	1) °	'	Ί `	1	
an equipotential surface at mean sea level. The maximum								
departure of the ellipsoid from the geoid is approximately +/-				ļ				
65 meters.)			ļ	}	ļ	1		
WGS-72=World Geodetic Survey 1972								
Nadir Earth Location Tolerance	501	502	u	2	1		kilometers	
Earth Location Bit Field	503			1 2	1	(
bits 15-3: <zero fill=""></zero>								
bit 2: dynamic attitude error correction (0=not performed;			ļ	1				İ
1=performed) bit 1: reasonableness test (0=inactive; 1=active)			l					
bit 0: constant attitude error correction (0=not performed;								
1=performed)	ļ		<u> </u>	<u> </u>				<u> </u>
<zero fill=""></zero>	505				2	1 (1	<u> </u>
Constant Roll Attitude Error	507			1		1 3	degrees	
Constant Pitch Attitude Error	509				2	<u>l</u>	degrees	
Constant Yaw Attitude Error	511				2		degrees	<u> </u>
Epoch Year for Orbit Vector	513				2	1 (ĭ	
Day of Epoch Year for Orbit Vector	515	516	<u> u</u>	12	2	1	y	J

	Start	End	Data	Word	Number	Scale		
Field Name					of Words		Units	Notes
Epoch UTC Time of Day for Orbit Vector	517			4	1		milliseconds	
Semi-major Axis (at the orbit vector epoch time)	521	524	i	4	1	5	kilometers	1
Eccentricity (at the orbit vector epoch time)	525	528	i	4	1	8		
Inclination (at the orbit vector epoch time)	529	532	i	4	Ī	5	degrees	
Argument of Perigee (at the orbit vector epoch time)	533	536	i	4	1	5	degrees	
Right Ascension of the Ascending Node (at the orbit vector	537	540	i	4	1	5	degrees	
epoch time)			_					
Mean Anomaly (at the orbit vector epoch time)	541			4	1		degrees	
Position Vector X Component (at the orbit vector epoch time)	545			4	1		kilometers	
Position Vector Y Component (at the orbit vector epoch time)	549			4	1		kilometers	
Position Vector Z Component (at the orbit vector epoch time)	553			4	1	5	kilometers	
Velocity Vector X-dot Component (at the orbit vector epoch	557	560	i	4	1	8	km/second	
time)								
Velocity Vector Y-dot Component (at the orbit vector epoch	561	564	i	4	1	8	km/second	
time)								
Velocity Vector Z-dot Component (at the orbit vector epoch	565	568	i	4	1	. 8	km/second	1
time)	5.60	570						4
Earth/Sun Distance Ratio (at the orbit vector epoch time;	569	572	u	4	1	6		
relative to the mean distance of 1 AU) Zero Fill>	572	500			4		i	+
THERMISTOR TELEMETRY CONVERSION	573	588	i	. 4	4	0		+-
Counts-to-temperature (K) conversion coefficients for the 24								
housekeeping thermistors.								
Thermistor Temperature Coefficient 0	589	592	i	4	1		K	+-+
Thermistor Temperature Coefficient 1	593			4			K/count	+
Thermistor Temperature Coefficient 2	597			4			K/count ²	+
Thermistor Temperature Coefficient 3	601	604		4			K/count ³	+
Thermistor Temperature Coefficient 4	605			4			K/count ⁴	1
<zero fill=""></zero>	609			4		- 10	r count	+
RAW CURRENT CONSUMPTION CONVERSION	- 002	<u> </u>	_ _		·			+
EE and SM +5V Current Coefficient 0	625	628	i	4	1	6	amps	+
EE and SM +5V Current Coefficient 1	629			4			amps/count	+ - 1
Receiver +8V Current Coefficient 0	633			4			amps	+
Receiver +8V Current Coefficient 1	637	640		4			amps/count	+
Receiver +15V Current Coefficient 0	641	644		4			amps	
Receiver +15V Current Coefficient 1	645			4	1		amps/count	+
Receiver -15V Current Coefficient 0	649			4			amps	+-
Receiver -15V Current Coefficient 1	653			4	1		amps/count	\top
RDM Motor Current Coefficient 0	657			4			amps	
RDM Motor Current Coefficient 1	661	664		4	1		amps/count	
FDM Motor Current Coefficient 0	665			4	1		amps	1
FDM Motor Current Coefficient 1	669			4	1		amps/count	
OBCT TEMPERATURE CONVERSION							· • · · · · · · · · · · · · · · · · · ·	
PRT resistance-to-temperature conversion coefficients, where	1							
resistance is in ohms and temperature is in K.								
PIE-A PRT 1 Coefficient 0	673			4	1		K	
PIE-A PRT 1 Coefficient 1	677			4	1		K/ohm	
PIE-A PRT 1 Coefficient 2	681	684		. 4	1		K/ohm²	
PIE-A PRT 1 Coefficient 3	685			4	1		K/ohm³	
PIE-A PRT 2 Coefficient 0	689			4	1		K	
PIE-A PRT 2 Coefficient 1	693			4	1		K/ohm	
PIE-A PRT 2 Coefficient 2	697			4	1		K/ohm²	
PIE-A PRT 2 Coefficient 3	701	704		4	1		K/ohm³	
PIE-A PRT 3 Coefficient 0	705			4	1		K	
PIE-A PRT 3 Coefficient 1	709	712	i	4	1	6	K/ohm	

THE LINE	Start				Number	Scale	Units	Notes
Field Name RIE-A PRT 3 Coefficient 2	713	716	i ype	Size	of Words	ractor	K/ohm²	140163
TE-A PRT 3 Coefficient 3	717	720	i	4	1		K/ohm³	
PIE-A PRT 4 Coefficient 0	721	724	i	4			K	
PIE-A PRT 4 Coefficient 1	725	728	- <u>i</u>	4			K/ohm	
PIE-A PRT 4 Coefficient 2	729		- <u>i</u> -	4			K/ohm²	
PIE-A PRT 4 Coefficient 3	733	736	i	4			K/ohm³	
PIE-A PRT 5 Coefficient 0	737	740	i	4			K	
PIE-A PRT 5 Coefficient 1	741	744	i	4			K/ohm	
PIE-A PRT 5 Coefficient 2	741			4			K/ohm²	
PIE-A PRT 5 Coefficient 2	749		- <u>i</u>	4			K/ohm³	
PIE-B PRT 1 Coefficient 0	753			4			K	╂──┤
PIE-B PRT 1 Coefficient 1	757	760	i i	4			K/ohm	
PIE-B PRT 1 Coefficient 2	761	764	i	4			K/ohm²	├
	765			1 4			K/ohm ³	
PIE-B PRT 1 Coefficient 3	769		i	4			K	
PIE-B PRT 2 Coefficient 0	773						K/ohm	+
PIE-B PRT 2 Coefficient 1	777	780	i				K/ohm ²	
PIE-B PRT 2 Coefficient 2	781	784		4			K/ohm ³	
PIE-B PRT 2 Coefficient 3			i	- 2			K	-
PIE-B PRT 3 Coefficient 0	785 789						K/ohm	
PIE-B PRT 3 Coefficient 1	793			4			K/ohm ²	+
PIE-B PRT 3 Coefficient 2		800	1 i		.		K/ohm³	
PIE-B PRT 3 Coefficient 3	797			4			K/omn	┼
PIE-B PRT 4 Coefficient 0	801	804	_	4	 		K/ohm	+
PIE-B PRT 4 Coefficient 1	805						K/ohm ²	
PIE-B PRT 4 Coefficient 2	809			4			K/ohm ³	┼
PIE-B PRT 4 Coefficient 3	813			4			K	
IE-B PRT 5 Coefficient 0	817			4			K/ohm	┼
PIE-B PRT 5 Coefficient 1	821			4			K/ohm ²	+
PIE-B PRT 5 Coefficient 2	825			4			K/ohm³	┼─
PIE-B PRT 5 Coefficient 3	829	832	1	-		13	K/OIIII	+
SURVIVAL TEMPERATURE CONVERSION								ł
Volts-to-temperature (K) conversion coefficients for the 3						İ		
survival temperature parameters. (NOTE: volts = 0.02 *				1		l		
counts.)	833	836	i	 	1 1	1 6	K	+-
Survival Temperature Coefficient 0	837				1		K/volt	+
Survival Temperature Coefficient 1	841				1		K/volt ²	+
Survival Temperature Coefficient 2	845				1		K/volt ³	+
Survival Temperature Coefficient 3 Survival Temperature Coefficient 4	849			 			K/volt ⁴	+
Survival Temperature Coefficient 4 Survival Temperature Coefficient 5	853				1		K/volt ⁵	+
ANTENNA POSITION CONVERSION	85.	850	1	 	<u> </u>	\	TO VOIC	+
Antenna Position Conversion Factor (for converting "mid-pixel	857	860	u	+	4	1 5	degrees/count	+
position" data of earth, space, and OBCT views to degrees)	85	1 600] "]	Ί `	dogrees, count	
value = 7.2/1024 = 0.00703125 degrees/count	1				ì			
PRT CALIBRATION CHANNELS	\vdash	 		 	 	† · · · · ·		+
PIE-A Calibration Channel 1 Resistance	861	864	i	 	4	1 4	ohms	
PIE-A Calibration Channel 2 Resistance	865				4		ohms	1
PIE-A Calibration Channel 3 Resistance	869				4		ohms	+
PIE-B Calibration Channel 1 Resistance	873			+	4		ohms	+
PIE-B Calibration Channel 2 Resistance	87			+	4		ohms	+
PIE-B Calibration Channel 3 Resistance	88				4		ohms	+
LIE-B Camplation Chamier 2 Vesignance	1 00	L 00-	1	ــــــــــــــــــــــــــــــــــــــ	<u>'l</u>	<u></u>	المستس	

	Start	End	Data	Word	Number	Scale			1
Field Name					of Words		Units	Notes	İ
LUNAR CONTAMINATION DETECTION								1	
Lunar Angle Threshold (Any space view whose lunar angle	885	886	u	2	1	2	degrees		
see "Lunar Angles" field in data recordis less than this value								1	
is flagged as being "lunar contaminated" and is not used in the									
calibration.)									
RFI CORRECTION									
Bias Correction Values (ordered by channel, FOV, and	887	1726	i	2	420	0	counts	2	
transmitter) (NOAA: content defined below) or	i l								
TBD (Metop)									
Word 1: Channel H1, FOV 1, STX_1 Word 2: Channel H2, FOV 1, STX_1	<u> </u>								
Word 3: Channel H3, FOV 1, STX_1							•		
Word 4: Channel H4, FOV 1, STX_1									
Word 5: Channel H5, FOV 1, STX_1 Word 6: Channel H1, FOV 5, STX_1]								
Chaine 111, 104 3, 31X_1									
(channel values for FOVs 5, 10, 15, , 90)									
Word 95: Channel H5, FOV 90, STX_1									
Word 96: Channel H1, space view, STX_1									
 Word 100: Channel H5, space view, STX_1									
Word 101: Channel H1, OBCT view, STX_1									
Word 106: Channel H1, FOV 1, STX_2									
Word 211: Channel H1, FOV 1, STX_3									
Word 316: Channel H1, FOV 1, SARR									
Word 420: Channel H5, OBCT view, SARR									
<zero fill=""></zero>	1727	1734	i	2	4	0			
Transmitter Reference Power (mean power at the time bias	1735	1742	i	2	4	1	counts	2	
corrections were derived. Range: 0 to 255, representing								1	
analog voltages from 0 to 5.1.) (NOAA: content defined below)									
or									
TBD (Metop)									ŀ
Word 1: STX-1 Word 2: STX-2									
Word 3: STX-3	1							į	
Word 4: SARR									
<zero fill=""></zero>	1743	1752	i	2	5	0			
METOP MANEUVERS IDENTIFICATION									
The fields in this section are Metop specific. For NOAA-									
originated MHS data, these fields are spare (zero fill).	1752	1754							ł
Start of Maneuver Year (four digits, e.g., 2000)		1754		2	1	0		_	ł
Start of Maneuver Day of Year (e.g., 365) Start of Maneuver UTC Time of Day	1757	1756 1760		2	1		milliseconds	+	ł
End of Maneuver Year (four digits, e.g., 2000)	1761			4	1	0	milliseconds	 	ł
End of Maneuver Day of Year (e.g., 365)		1764			1	- 0		+	ł
End of Maneuver UTC Time of Day		1768		1	1	<u> </u>	milliseconds		ł
Change in Spacecraft Velocity (ΔV)	1769				2		TBD	+	ł
Word 1: TBD	1,09	1,00	•	"	3	עמו	יייי		
Word 2: TBD									
Word 3: TBD	1500	1500						 	l
Spacecraft Mass Word 1: Mass before maneuver	1781	1788	u	4	2	TBD	TBD		l
Word 2: Mass after maneuver									
FILLER									
<zero fill=""></zero>	1789	3072	i	2	642	0			
									4

6.2 MHS 1b Data Record Format (Science Packet)

				I				
	Start				Number	Scale		D V 4
Field Name	Octet	Octet	Type	Size	of Words	Factor	<u>Units</u>	Notes
SCAN LINE INFORMATION	ļ							+
Scan Line Number (cumulative, starting with 1)	1	2	u	2	1			
Scan Line Year (four digits, e.g., 2000)	3	4	u	2	1			
Scan Line Day of Year (e.g., 365)	5	6	u	2	1			J
Satellite Clock Drift Delta	7	8	i	2	1	C	milliseconds	
Scan Line UTC Time of Day	9	12	u	4	1	(milliseconds	
Scan Line Bit Field	13	14	u	2	1	C		
bit 15: satellite direction (0=northbound; 1=southbound)						ŀ		
bit 14: clock drift correction (0=not corrected; 1=scan time corrected					,			
for clock drift)					i	ĺ		İ
bits 13-0: <zero fill=""></zero>	15	16		2	1	 		+
Major Frame Count (cumulative, starting with 1) (NOAA) or	15	16	u	4	l '	۱ ۲	1	i
<zero fill=""> (Metop)</zero>				 	ļ .			
Coarse MHS On-board Time (OBT) (time since last reset to	17	20	u	4	1	'	seconds	
zero)	-			_				
Fine MHS OBT (fraction of second since last increment of	21	22	u	2	1	(ł	
coarse MHS OBT. Resolution: 2 ⁻¹⁶ seconds; range: 0-								
65,535.)	ļ							<u> </u>
MHS Mode Flag	23	23	u	1	1	(P	
0=power-on ("empty" MHS science data)	1	Ì			,			
1=warm-up ("empty" MHS science data)								
2=standby ("empty" MHS science data) 3=scan (valid MHS science data)								
4=fixed view (valid MHS science data, but instrument is viewing a fixed								
ation)								
=self-test (test data)								
6=safeing ("empty" MHS science data)			1					
7=fault ("empty" MHS science data)				i				
8-14= <undefined> (unknown data) 15=memory dump (memory dump data)</undefined>								
Zero Fill>	24	24	i	1	1	(1	_
QUALITY INDICATORS				 	-	 ``	}	1
Quality Indicator Bit Field (if a bit is on (=1), the statement is	25	28	u	 	1	-		-
1	23	20	1 "		1	1 `	1	
true)	1							
bit 31: do not use scan for product generation bit 30: time sequence error detected within this scan (see below)								
bit 29: data gap precedes this scan (gap may be due to actual lost						ŀ		
scans or scans in which the TIP or MIU are in non-nominal modes)								
bit 28: insufficient data for calibration (see below)	İ							
bit 27: earth location data not available (see below)				1				
bit 26: first good time following a clock update (nominally 0)		1						
bit 25: instrument status changed with this scan bits 24 - 5: <zero fill=""></zero>								
bit 4: transmitter status change occurred (see note 2)								
bit 3: AMSU sync error detected (NOAA) or <zero fill=""> (Metop)</zero>								
bit 2: AMSU minor frame error detected (NOAA) or <zero fill=""> (Metop)</zero>								
bit 1: AMSU major frame error detected (NOAA) or <zero fill=""> (Metop)</zero>		1		1				1
bit 0: AMSU parity error detected (NOAA) or <zero fill=""> (Metop)</zero>	<u> </u>	<u> </u>	L		L	L		

	Start	End	Data	Word	Number	Scale	<u>.</u> .	
Field Name	Octet	Octet	Туре	Size	of Words	Factor	Units	Notes
Scan Line Quality Flags [Time Problem Code] (If a bit is on	29			1	1	0		
(=1), the statement is true. All bits off implies the scan time is								
as expected.)								
bit 7: time field is bad but can probably be inferred from the previous good time								
bit 6: time field is bad and can't be inferred from the previous good								
time								
bit 5: this record starts a sequence that is inconsistent with previous								1
times (i.e., there is a time discontinuity). This may be associated with a spacecraft clock update. (See bit 26, Quality Indicator Bit Field.)								
bit 4: start of a sequence that apparently repeats scan times that have								
been previously accepted								
bits 3-0: <zero fill=""></zero>								
QUALITY INDICATORS	20	21						
Scan Line Quality Flags [Calibration Problem Code] (If a bit is	30	31	u	1	2	l 9		
on (=1), the statement is true. These bits complement the channel indicators: all bits set to 0 indicates normal								
[· · · · · · · · · · · · · · · · · · ·								
calibration.) Word 1								
bits 7-3: <zero fill=""></zero>								
bit 2: scan line was not calibrated because of satellite maneuver	1							
(Metop) or <zero fill=""> (NOAA)</zero>		ļ						1 1
bit 1: scan line contains one or more space views that are lunar contaminated なん しょうしゅう しゅう								1 1
bit 0: lunar-contaminated scan line/was able to be calibrated (only								
applicable if the previous flag [bit 9] is 1; otherwise, zero)								
Word 2								
bit 7: scan line was not calibrated because of bad time								
bit 6: scan line was calibrated using fewer than the preferred number of								L
scan lines because of proximity to start or end of data set or to a data								
gap bit 5: scan line was not calibrated because of bad or insufficient PRT					1	1		
data						•		
bit 4: scan line was calibrated but with marginal PRT data								
bit 3: some uncalibrated channels on this scan (see channel indicators) bit 2: uncalibrated due to instrument mode								
bit 1: questionable calibration because of antenna position error of								
space view		l						
bit 0: questionable calibration because of antenna position error of								
OBCT view Scan Line Quality Flags [Earth Location Problem Code] (If a	32	32	- ,,	1	1			+
bit is on (=1), the statement is true. All bits set to 0 implies the	32	32	u	1	1	l Y		
earth location was normal.)	ĺ	ļ						
bit 7: not earth located because of bad time; earth location fields zero-				ŀ				
filled		1						
bit 6: earth location questionable: questionable time code (see time								
problem flags above) bit 5: earth location questionable: marginal agreement with								[
reasonableness check								
bit 4: earth location questionable: fails reasonableness check								
bit 3: earth location questionable because of antenna position check	1							
bit 2: <zero fill=""> bit 1: not earth located because of satellite in-plane maneuver (Metop)</zero>]	1	<u> </u>					
or <zero fill=""> (NOAA)</zero>								
bit 0: not earth located because of satellite out-of-plane maneuver	}			1				
(Metop) or <zero fill=""> (NOAA)</zero>	<u> </u>	<u> </u>	<u> </u>					

	Start	End	Data	Word	Number	Scale		$ \uparrow $
Field Name					of Words		Units	Notes
Palibration Quality Flags (all bits off implies a good	33			2	5	0		
alibration)								
Word 1: Channel H1	1			İ				
bits 15-7: <zero fill=""></zero>								
bit 6: this scan line is either the last one before or the first one after a sudden, anomalous jump (or drop) in calibration counts								
bit 5: all bad OBCT view counts for scan line								
bit 4: all bad space view counts for scan line								1
bit 3: all bad PRTs for this line					·			1
bit 2: marginal OBCT view counts for this line				i	,			1
bit 1: marginal space view counts for this line bit 0: marginal PRT temps on this line					·			
or or marginary temps on any mic								
Words 2-5: Channels H2-H5 (in order)								
<zero fill=""></zero>	43	60	i	2	9	0		
CALIBRATION COEFFICIENTS								1
Note: The following coefficients are only available in Scan and								
Fixed View modes, otherwise the coefficient fields are <zero< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></zero<>								
Fill>. Refer to bits 7-4 of the Mode and Sub-commutation								
Code field for the current mode.				ļ				
Primary Calibration Ch H1 Second Order Term, a2	61	64		4	1	16		
Primary Calibration Ch H1 First Order Term, a1	65			4	1	10		
Primary Calibration Ch H1 Zeroth Order Term, a0	69			4	1	6		
Primary Calibration Ch H2 Second Order Term, a2	73			4	1	16		
Primary Calibration Ch H2 First Order Term, a1	77			4	1	10		
Primary Calibration Ch H2 Zeroth Order Term, a0	81	84		4	1	6		<u> </u>
Primary Calibration Ch H3 Second Order Term, a2	85			4	1	16		
Primary Calibration Ch H3 First Order Term, a1	89			4	1	10		
rimary Calibration Ch H3 Zeroth Order Term, a0	93		4	4	1	6		
rimary Calibration Ch H4 Second Order Term, a2	97			1 4	1	16		
Primary Calibration Ch H4 First Order Term, a1	101			4	1	10		+
Primary Calibration Ch H4 Zeroth Order Term, a0	105			4	1	16		+
Primary Calibration Ch H5 Second Order Term, a2	109			4	1	10		-
Primary Calibration Ch H5 First Order Term, a1				4	1	-	-	-
Primary Calibration Ch H5 Zeroth Order Term, a0	117			4	1 1	16	<u> </u>	+
Secondary Calibration Ch H1 Second Order Term, a2	121			1 4	1	10		+
Secondary Calibration Ch H1 First Order Term, a1	125 129				1	10		
Secondary Calibration Ch H1 Zeroth Order Term, a0	133			- 4	1 1	16		+
Secondary Calibration Ch H2 Second Order Term, a2	133			- 7	1	10		
Secondary Calibration Ch H2 First Order Term, a1				- 4	1 1	6		
Secondary Calibration Ch H2 Zeroth Order Term, a0	141 145			- 4	 	16		
Secondary Calibration Ch H3 Second Order Term, a2	143	-			-	10		
Secondary Calibration Ch H3 First Order Term, a1 Secondary Calibration Ch H3 Zeroth Order Term, a0	153			-	1 1	6		+
	157			4	1 1	16		+
Secondary Calibration Ch H4 Second Order Term, a2	161	-			ļ	10		+
Secondary Calibration Ch H4 First Order Term, a1	165					6		+
Secondary Calibration Ch H4 Zeroth Order Term, a0 Secondary Calibration Ch H5 Second Order Term, a2	169			4	_	16		+
	173			1 4		10		
Secondary Calibration Ch H5 First Order Term, a1 Secondary Calibration Ch H5 Zeroth Order Term, a0	177			4	<u> </u>	6		-
	181			1 2				+
<zero fill=""> NAVIGATION</zero>	101	104	 	 	1	 	 	+
Computed Yaw Steering (Metop: content defined below) or	185	100	i) 2	-	degrees	+
Zero Fill> (NOAA)	103	190	1 '	'	1 3	Ι ,	The Breeze	
ord 1: Computed roll angle								
Word 2: Computed pitch angle								
Word 3: Computed yaw angle]		<u> </u>	<u> </u>	<u></u>		L	<u> </u>

Field Name	Start	End Octet			Number of Words		Units	Notes
	191	196		2	3		degrees	Tiotes
Total Applied Attitude Correction Word 1: Roll Word 2: Pitch Word 3: Yaw								
Navigation Status Bit Field (bits 20-18 are Metop specific and will contain zero fill for NOAA; bits 11-0 are NOAA specific	197	200	u	4	1	0		
and will contain zero fill for Metop) bits 31-21: <zero fill=""></zero>			'					
bit 20-19: yaw steering parameters usage indicator (0=no yaw steering correction; 1=computed parameters from Metop data stream; 2=measured parameters from Metop data stream; 3=computed parameters from AELDS)								
bit 18: Metop maneuver indicator (0=scan does not occur during a Metop in-plane or out-of-plane maneuver; 1=scan, or some part of it, occurs during a maneuver)								
bit 17: earth location at the satellite subpoint is accurate and reasonable, i.e., is within tolerance defined by "Nadir Earth Location Tolerance" in header (0=out of tolerance; 1=in tolerance) bit 16: earth location corrected for Euler angles (0=FALSE; 1=TRUE)								
bits 15-12: earth location indicator (0=earth location available; 1=user ephemeris files greater than 24 hours old; 2=no earth location available) bits 11-8: spacecraft attitude control (0=operating in YGC or NOMINAL								
mode; 1=operating in another mode; 2=attitude exceeds nominal tolerance; 3=both 1 and 2) bits 7-4: attitude SMODE (0=nominal mode; 1=rate nulling mode;								
2=YGC mode; 3=search mode; 4=coast mode) bits 3-0: attitude PWTIP\$AC (0=nominal mode/no test; 1=yaw axis test in progress; 2=roll axis test in progress; 3=pitch axis test in progress)								
Time Associated with Euler Angles	201			4	1		seconds	_
Euler Angles (NOTE: For Metop-originated AMSU-A data, this field is also referred to as the measured yaw steering parameters.)	205	210	i	2	3	3	degrees	
Word 1: Roll Word 2: Pitch Word 3: Yaw								
Spacecraft Altitude above Reference Ellipsoid	211			2	1		kilometers	
Angular Relationships (relative azimuth range +/- 180.00 degrees)	213	752	i	2	270	2	degrees	
Word 1: Solar zenith angle, FOV 1 Word 2: Satellite zenith angle, FOV 1 Word 3: Relative azimuth angle, FOV 1 Word 4: Solar zenith angle, FOV 2								
 (set of 3 angles every FOV) 								
Word 270: Relative azimuth angle, FOV 90	L							
Earth Location (north latitude and east longitude are positive) Word 1: Latitude, FOV 1 Word 2: Longitude, FOV 1	753	1472	i	4	180	4	degrees	
Word 3: Latitude, FOV 2 (lat/lon word pair every FOV)								
 Word 180: Longitude, FOV 90								
Lunar Angles (angles between moon and individual space views; range 0 to 180.00 degrees) Word 1: Angle between moon and space view 1	1473	1480	u	2	4	2	degrees	
Word 2: Angle between moon and space view 2 Word 3: Angle between moon and space view 3 Word 4: Angle between moon and space view 4								

					Number	Scale	77.1.	
Field Name	Octet	Octet	Type	Size	of Words	Factor	<u>Units</u>	Notes
MHS SENSOR DATA								
In fixed view mode, the pixel data is the same format as scan								
mode, but the concept of earth, space, and OBCT views does		ł			1			
not apply. All 98 views (i.e., 90 earth + 4 space + 4 OBCT)	Į.			,				
are for the fixed view position.		ĺ						
Scene (Earth View) Data (range: 0 - 65,535)	1481	2560	u	2	540	0	counts	
Word 1: Mid-pixel position for FOV 1		2500		~	1	ľ		
Word 2: Scene counts for FOV 1, channel H1			-					Ì
Word 3: Scene counts for FOV 1, channel H2							1	
Word 4: Scene counts for FOV 1, channel H3								
Word 5: Scene counts for FOV 1, channel H4								
Word 6: Scene counts for FOV 1, channel H5								
Word 7: Mid-pixel position for FOV 2	1]			1	1		
Words 8-12: Scene counts for FOV 2, channels H1-H5 (in order)		1						
···								
(6 words for every FOV)	l .							
Mord F35. Mid pixel position for FOV 00							ł	
Word 535: Mid-pixel position for FOV 90 Words 536-540: Scene counts for FOV 90, channels H1-H5 (in order)						ļ.]	ļ
<pre><zero fill=""></zero></pre>	2561	2568	i	<u> </u>	1 2			
	2301	2300		-				+
CALIBRATION DATA	25.00	2616		ļ <u>-</u>	24			-
Space View Data (range: 0 - 65,535)	2569	2616	u	4	24	'	counts	
Word 1: Mid-pixel position for space view 1								
Word 2: Counts for space view 1, channel H1 Word 3: Counts for space view 1, channel H2			1					
Word 4: Counts for space view 1, channel H3	ł			l		ŀ		
Word 5: Counts for space view 1, channel H4					1			
Word 6: Counts for space view 1, channel H5			l l					
Word 7: Mid-pixel position for space view 2			İ	1				
Word 8-12: Counts for space view 2, channel H1-H5 (in order)								
ord 13: Mid-pixel position for space view 3								
Word 14-18: Counts for space view 3, channel H1-H5 (in order)	i				1			
Word 19: Mid-pixel position for space view 4								
Word 20-24: Counts for space view 4, channel H1-H5 (in order)								
OBCT View Data <i>(range: 0 - 65,535)</i>	2617	2664	u] 2	24	(counts	
Word 1: Mid-pixel position for OBCT view 1								
Word 2: Counts for OBCT view 1, channel H1					1			
Word 3: Counts for OBCT view 1, channel H2					i	ļ.		
Word 4: Counts for OBCT view 1, channel H3								
Word 5: Counts for OBCT view 1, channel H4 Word 6: Counts for OBCT view 1, channel H5			1					
Word 7: Mid-pixel position for OBCT view 2	ł			ļ	ŀ			
Word 8-12: Counts for OBCT view 2, channel H1-H5 (in order)								
Word 13: Mid-pixel position for OBCT view 3								
Word 14-18: Counts for OBCT view 3, channel H1-H5 (in order)			1			1		
Word 19: Mid-pixel position for OBCT view 4								
Word 20-24: Counts for OBCT view 4, channel H1-H5 (in order)	1	<u> </u>		L	<u> </u>	ļ	<u> </u>	
<zero fill=""></zero>	2665	2672	i	4	1 2)	
POSITION VALIDITY FLAGS								
There is one bit flag for each FOV (earth, space, and OBCT).			1				1	
If bit flag = 0, then mid-pixel antenna position for								
corresponding FOV is within its nominal range. Otherwise (if		ļ						1
= 1), position is outside of its nominal range.						1		,
	2672	2684		 	12	,	 	+ - 2
Earth View Position Validity Flags	2673	2084	u	1 '	۱ 1 <i>4</i>	1 '	1	
Word 1: position flags for FOVs 1-8 (bits 0-7)								-
Word 2: position flags for FOVs 9-16 (bits 0-7)						1		
 Word 11: position flags for FOVs 81-88 (bits 0-7)					1			
Word 12: position flags for FOVs 89-90 (bits 0-1; bits 2-7 are <zero< td=""><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td></zero<>				1				
fill>)								- 1
!!!/ <i> </i>	1							

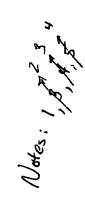
Etald Nama					Number of Words		Units	Notes	
Field Name				Size	OT ALOLOS	racior	Omts	Notes 3	
Space View Position Validity Flags	2685	2083	u	1 1	1	l 4		3	
bits 7-4: <zero fill=""> bit 3: position flag for space view 4</zero>	ŀ								
bit 2: position flag for space view 3									
bit 1: position flag for space view 2								-	l
bit 0: position flag for space view 1						l			1
OBCT View Position Validity Flags	2686	2686	u	1	1	Q		3	1
bits 7-4: <zero fill=""></zero>						i i			i
bit 3: position flag for OBCT view 4									1
bit 2: position flag for OBCT view 3									
bit 1: position flag for OBCT view 2									
bit 0: position flag for OBCT view 1			<u> </u>		<u> </u>				1
FULL HOUSEKEEPING DATA	<u> </u>			ļ					1
Mode and Sub-commutation Code	2687	2687	u	1	1	l d			1
bits 7-4: mode code (0=power on; 1=warm up; 2=stand by; 3=scan;									
4=fixed view; 5=self test; 6=safeing; 7=fault; 8-14= <unused>;</unused>	l			l	l				
15=memory data packet ID)					İ				
bit 3: PIE ID (0=PIE A; 1=PIE B)	l			ĺ					1
bits 2-0: sub-commutation code (only meaningful for telemetry packet			ŀ		1			1	1
data)	2688	2692	u	 1		1	· · · · ·	-	1
Telecommand Acknowledgement and Fault Code Words 1-2:	2000	2092	ľ	1 1	3	1 4			
bit 15: TC clean (1=no parity or checksum error found in received									
packet)	1								
bit 14: TC conforms (1=header of received command conforms to the					ĺ			ŀ	1
CCSDS format)								İ	1
bit 13: TC recognized (1=received command is a recognized MHS		1	ŀ]					
command of the correct format)									
bit 12: TC legal (1=received command is legal for execution in the								1	
current MHS operating mode)				ŀ	İ				ŀ
bit 11: FDM motor current trip status (1=instantaneous current in the					1				
FDM motor has exceeded a pre-set level, resulting in the disabling of		ļ	1	ł				1	
the FDM motor drive circuit)	1			ļ		·		1	
bits 10-0: TC application ID (taken from the packet ID field of the primary header of the received serial command)				ľ					1
primary reader of the received serial community									1
Words 3-4:		1		1					
bits 15-2: TC packet sequence count	1								
bits 1-0: TC received count			l					i	
									ı
Word 5:	İ	1	ł						1
bit 7: current monitor fault (1=one or more PSU current monitor				1				14.65	
parameters exceed their expected limits); see note 4	i	i	1				- \$	14/2	ı
bit 6: thermistor monitor fault (1=one or more thermistor temperature monitor parameters exceed their expected limits); see note 4								'	
bit 5: switch fault (1=a switch status telemetry parameter does not	ľ	1						-	1
agree with its last commanded state, or a PROM board switch error has			ŀ					ŀ	1
occurred)	` 	ļ		ŀ	ł				
bit 4: processor fault (1=a processor internal fault has occurred				İ					
(overflow, illegal address, BIT failure))	1			1		1 1			1
bit 3: RDM motor current trip status (1=instantaneous current in the		1							1
RDM motor has exceeded a pre-set level, resulting in the disabling of	1			1					
the RDM motor drive circuit)		1		1					
bit 2: DC offset error (1=one or more channel calibration target's		1	1						
readings indicate a change in the DC offset is required)								1	1
bit 1: scan control error (1=the measured mid-pixel position of the		1			1				
reflector during earth, space, or OBCT views is outside the limits for the	*	1							1
scan mode profile, or the reflector position is outside the limits of the requested position for fixed view mode, or the position acquisition									
requested position for fixed view inlode, or the position acquisition	1	l		1	1	1		1	1
initialization has failed); see note 5	1	1	1				i		1
initialization has failed); see note 5 bit 0: REF CK error (1=scan control clock stops as a result of the	1								

	Start	End	Data	Word	Number	Scale		
Field Name				Size	of Words	Factor	Units	Notes
witch Status	2693	2695	u	1	3	o		
Nord 1: bit 7: receiver channel H4 backend (0=off; 1=on)								
bit 6: receiver channel H3 backend (0=off; 1=on)								
bit 5: receiver channel H3/H4 local oscillator selected (0=A; 1=B)		1						
bit 4: receiver channel H3/H4 front-end (0=off; 1=on)								
bit 3: receiver channel H2 local oscillator selected (0=A; 1=B)								
bit 2: receiver channel H2 (0=off; 1=on)								
bit 1: receiver channel H1 local oscillator selected (0=A; 1=B)					· ·			1
bit 0: receiver channel H1 (0=off; 1=on)								
Word 2: bit 7: PROM (1=a PROM segment switch has failed ON)								
bit 6: signal processing electronics/scan control electronics (0=off;					1			
1=on)								
bit 5: auxiliary operational heaters (0=off; 1=on)								1
bit 4: scan mechanism operational heaters (0=off; 1=on)								
bit 3: receiver operational heaters (0=off; 1=on)								
bit 2: Rx CV (0=off; 1=on)								
bit 1: receiver channel H5 local oscillator selected (0=A; 1=B) bit 0: receiver channel H5 (0=off; 1=on)								
Word 3:		1]	·		
bit 7: FDM motor current trip status (0=enabled; 1=disabled)		ŀ		1				
bit 6: RDM motor current trip status (0=enabled; 1=disabled)				ļ				
bit 5: FDM motor supply (0=off; 1=on)	i	1						
bit 4: RDM motor supply (0=off; 1=on)					i			
bit 3: FDM motor sensors selected (0=A; 1=B)			ļ		ļ	1		
bit 2: RDM motor sensors selected (0=A; 1=B)			ļ.					
bit 1: FDM zero position sensors (0=A; 1=B)		İ	İ					
bit 0: RDM zero position sensors (0=A; 1=B)	2696	2719	u	1	24	0	counts	
Temperature Data (range: 0-255)	2090	1 2/13	1 "		1	1 ,	Counts	1 1
Word 1: LO H1 temperature Word 2: LO H2 temperature		l						
ord 3: LO H3/H4 temperature	1		1	1	ł			
Word 4: LO H5 temperature		ŀ	İ					
Word 5: Mixer/LNA/Multiplexer H1 temperature					1			
Word 6: Mixer/LNA/Multiplexer H2 temperature			1					
Word 7: Mixer/LNA/Multiplexer H3/H4 temperature		ļ						1
Word 8: Mixer/LNA/Multiplexer H5 temperature		1	İ	ŀ				
Word 9: Quasi-optics baseplate temperature #1 (dichroic D1(A) or					ł	ŀ		1
polarisor(B)) Word 10: Quasi-optics baseplate temperature #2 (dichroic D2(A) or				1	ŀ			
mirror(B))						1		
Word 11: IF baseplate temperature #1	İ			İ	!			1
Word 12: IF baseplate temperature #2	1		1	1	1			
Word 13: Scan mechanism core temperature								
Word 14: Scan mechanism housing temperature								
Word 15: RDM SSHM temperature					1		1	
Word 16: FDM SSHM temperature Word 17: Structure 1 temperature (-A edge, next to baseplate cutout)	1			1				1
Word 18: Structure 2 temperature (-A edge, in-between Rx and SM)								
Word 19: Structure 3 temperature (-V edge, in-between EE and SM)	1							
Word 20: Processor module temperature					1	1	1	
Word 21: Main DC/DC converter module temperature	1					1		1
Word 22: SCE RDM module temperature	1	1						
Word 23: SCE FDM module temperature	1		1	1		1	1	
Word 24: RF DC/DC converter module temperature	2720	272	5 u	 	1	1 (counts	+
Raw Current Consumption Data (internal PSU current analog	2/20	1 2/2	l u		1 '	1 '	Tomics	
telemetry; range: 0-255)		1					1	
Word 1: EE and SM +5V current		1	1					
Word 2: receiver +8V current Word 3: receiver +15V current		1						1
Word 4: receiver -15V current	1							
Word 5: RDM motor current			1					
ford 6: FDM motor current								L
<zero fill=""></zero>	2720	6 272	6 i		1	1 (ol	

TO 13 No	Start				Number				
Field Name	Octet	Octet	Type	Size	of Words	Factor	Units	Notes	
STATUS WORD	L								
Status Word bit 7: DC offset valid (1=all channels' calibration target's readings lie within acceptable limits) bit 6: scan control valid: only set in scan mode or fixed view mode (1=all mid-pixel positions of the reflector during earth, space, or OBCT views are within limits)	2727	2727	u	1	1				
bits 5-4: profile (0=profile 0the nominal scan mode profile with nominal space view position; 1=profile 1alternate space view position; 2=profile 2alternate space view position; 3=no profile calculatedprofile will be manually loaded and modified)									
bits 3-0: <unused></unused>									1
<zero fill=""></zero>	2728	2734	i	1	7	0			ĺ
SIGNAL PROCESSING STATUS									l
DC Offset Words (range: 0-255) Word 1: Channel H1 DC offset word Word 2: Channel H2 DC offset word Word 3: Channel H3 DC offset word Word 4: Channel H4 DC offset word Word 5: Channel H5 DC offset word	2735	2739	u	1	5	0	counts		
Channel Valid Flags	2740	2740	u	1	1	0	-	1	ĺ
bit 7: H1 valid (1=all samples of channel H1 for this scan lie within the ADC dynamic range) bit 6: H2 valid (1=all samples of channel H2 for this scan lie within the ADC dynamic range)		27.10	ű		•	Ĭ			
bit 5: H3 valid (1=all samples of channel H3 for this scan lie within the ADC dynamic range) bit 4: H4 valid (1=all samples of channel H4 for this scan lie within the ADC dynamic range)									
bit 3: H5 valid (1=all samples of channel H5 for this scan lie within the ADC dynamic range) bits 2-0: SPE MUX code (0=channel H1 connected to SPE 6; 1=H2 to SPE 6; 2=H3 to SPE 6; 3=SPE 6 not used; 4=H4 to SPE 6; 5=H5 to SPE 6; 6=SPE 6 not used; 7=SPE 6 not used)									
Channel Gain (i.e., gain setting of the receiver video output channels) Values of 0 to 3 imply 0 db gain to 3 dB gain, respectively. Values of 4	2741	2743	u	1	3	0			
to 7 are not used. Word 1: bits 7-5: channel H1 gain									
bits 4-2: channel H2 gain bits 1-0: <unused></unused>									
bits 7-5: channel H3 gain bits 4-2: channel H4 gain bits 1-0: <unused></unused>			ţ						
Word 3: bits 7-5: channel H5 gain bits 4-2; <unused></unused>									
bits 1-0: <unused></unused>									
<zero fill=""></zero>	2744	2750	i	1	7	0			
OBCT TEMPERATURE DATA				_				\vdash	
OBCT (PRT) Readings	2751	2760	u	2	5	n	counts	+	
Word 1: PRT 1	-/1		-			١	7 44110		:
Word 2: PRT 2									
Word 3: PRT 3									
Word 4: PRT 4 Word 5: PRT 5									
PRT Calibration Channels	2761	2766	u	2	3	7	counts	†	
Word 1: Calibration channel 1 (upper value) Word 2: Calibration channel 2 (middle value) Word 3: Calibration channel 3 (lauren value)		00	-						
Word 3: Calibration channel 3 (lower value)	05.5	25.55	<u> </u>					1	
<zero fill=""></zero>	2767	2768	i	2	1	0			_

	Start				Number	Scale		
Field Name	Octet			Size	of Words			Notes
Computed OBCT Temperatures ord 1: OBCT temperature 1 (based on PRT 1 reading) Word 2: OBCT temperature 2 (based on PRT 2 reading) Word 3: OBCT temperature 3 (based on PRT 3 reading) Word 4: OBCT temperature 4 (based on PRT 4 reading) Word 5: OBCT temperature 5 (based on PRT 5 reading)	2769	2788	u	4	5	3	K	
SPARES								
	2789	2833		1	45	0		
Science Packet Spare Words (set to zero) <zero fill=""></zero>	$\overline{}$			1	43	0		
<u></u>	2834	2834	i	<u>_</u>	1			/ .
DISCRETE TELEMETRY Equivalent to digital B and analog housekeeping telemetry in other instruments.							(
Main Bus Select Status (indicate which main bus (A or B) is used by the MHS) 1 (0V)=A bus (relay closed) 0 (5V)=B bus (relay opened)	2835	2835	u	1	1	0		
MHS Survival Heater (NOAA: content defined at right) or <zero fill=""> (Metop) 1=on 0=off</zero>	2836	2836	u	1	1	C		
RF Converter Protect Disable (NOAA: content defined at right) or <zero fill=""> (Metop) 1=no</zero>	2837	2837	u	1	1	C		
0=yes MHS Power A (NOAA: content defined at right) or <zero fill=""> (Metop) 1=on 8=off</zero>	2838	2838	u	1	1	C		
THS Power B (NOAA: content defined at right) or Zero Fill> (Metop) 1=on 0=off	2839	2839	u	1	1	C		
Main Converter Protect Disable (NOAA: content defined at right) or <zero fill=""> (Metop) 1=no 0=yes</zero>	2840	2840	u	1	1	(
Survival Temperatures Word 1: Receiver temperature Word 2: Electronics equipment temperature Word 3: Scan mechanism temperature	2841			2	3	(counts	
Transmitter Telemetry (NOAA: content defined below) or <zero fill=""> (Metop) Word 1: STX-1 status Word 2: STX-2 status Word 3: STX-3 status Word 4: STX-4 status Word 5: STX-1 power Word 6: STX-2 power Word 7: STX-3 power Word 8: SARR-A power Word 9: SARR-B power</zero>	2847	2864	u		9		counts	

	Start	End	Data	Word	Number	Scale		T
Field Name	1				of Words		Units	Notes
Discrete Telemetry Update Flags (If bit = 0, associated	2865			1	4	0		1/2
telemetry item is up-to-date. If bit = 1, associated telemetry								1
item was not updated during most recent telemetry cycle -				ı				
possibly due to lost frame.)								1
bits 31-18: <zero fill=""></zero>							•	1
bit 17: SARR-B power (NOAA) or <zero fill=""> (Metop)</zero>								
bit 16: SARR-A power (NOAA) or <zero fill=""> (Metop)</zero>								
bit 15: STX-3 power (NOAA) or <zero fill=""> (Metop)</zero>								
bit 14: STX-2 power (NOAA) or <zero fill=""> (Metop)</zero>								1
bit 13: STX-1 power (NOAA) or <zero fill=""> (Metop)</zero>								
bit 12: STX-4 status (NOAA) or <zero fill=""> (Metop)</zero>								
bit 11: STX-3 status (NOAA) or <zero fill=""> (Metop) bit 10: STX-2 status (NOAA) or <zero fill=""> (Metop)</zero></zero>								
bit 9: STX-1 status (NOAA) or <zero fill=""> (Metop)</zero>								
bit 8: Scan mechanism temperature		Ì						
bit 7: Electronics equipment temperature								
bit 6: Receiver temperature		1						
bit 5: Main converter protect disable (NOAA) or <zero fill=""> (Metop)</zero>							1	
bit 4: MHS power B (NOAA) or <zero fill=""> (Metop)</zero>	i							
bit 3: MHS power A (NOAA) or <zero fill=""> (Metop)</zero>								
bit 2: RF converter protect disable (NOAA) or <zero fill=""> (Metop)</zero>								
bit 1: MHS survival heater (NOAA) or <zero fill=""> (Metop)</zero>	1				Į.			
bit 0: Main bus select status	1							ļ
<u>FILLER</u>								ļ
<zero fill=""></zero>	2869	3072	i	2	102	0		



6.3 MHS 1b Data Record Format (Extended Test Data Packet)

	· · · · · · · · · · · · · · · · · · ·		,	,				
					Number	Scale		
Field Name	Octet	Octet	Type	Size	of Words	Factor	Units	Notes
SCAN LINE INFORMATION	<u> </u>							<u> </u>
Scan Line Number (cumulative, starting with 1)	1	2	u	2	1	C		
Scan Line Year (four digits, e.g., 2000)	3	4	u	2	1	0		
Scan Line Day of Year (e.g., 365)	5	6	u	2	1	(
Satellite Clock Drift Delta	7	8	i	2	1		milliseconds	
Scan Line UTC Time of Day	9	12	u	4	1	(milliseconds	
Scan Line Bit Field	13			2	1			
bit 15: satellite direction (0=northbound; 1=southbound)		1			ļ			1
bit 14: clock drift correction (0=not corrected; 1=scan time corrected			1			ŀ	ļ	
for clock drift)								
bits 13-0: <zero fill=""></zero>								
Major Frame Count (cumulative, starting with 1) (NOAA) or	15	16	u	2	1	(X	
<zero fill=""> (Metop)</zero>	1					l		
Coarse MHS On-board Time (OBT) (time since last reset to	17	20	u	4	1	(seconds	1
zero)	ļ							
Fine MHS OBT (fraction of second since last increment of	21	22	u	2	1	(
coarse MHS OBT. Resolution: 2 ⁻¹⁶ seconds; range: 0 -			-]			
65,535.)					1			
MHS Mode Flag	23	23	u	1	 1	(
0=power-on ("empty" MHS science data)		23	"	1 1	1 *	\ \ \ \	1	
1=warm-up ("empty" MHS science data)	İ		į					
2=standby ("empty" MHS science data)					İ			
B=scan (valid MHS science data)		ļ	ŀ					
4=fixed view (valid MHS science data, but instrument is viewing a fixed	1		l	1				
cation)		ł	1					1
s=self-test (test data)				l	i			
6=safeing ("empty" MHS science data)	1	1						
7=fault ("empty" MHS science data)		İ		ļ	1	1		
8-14= <undefined> (unknown data)</undefined>				1	1			
15=memory dump (memory dump data)	24	24	i	11	1	-		+
<zero fill=""></zero>	Z4	24	1 1	<u> </u>		· · · · · ·	1	-
QUALITY INDICATORS	ļ . <u></u>		<u> </u>			!		
Quality Indicator Bit Field (if a bit is on (=1), the statement is	25	28	g u	1 4		'	ነ	
true)	1		l			1		
bit 31: do not use scan for product generation								ł
bit 30: time sequence error detected within this scan (see below)	1			1				1
bit 29: data gap precedes this scan (gap may be due to actual lost	1					ļ		1
scans or scans in which the TIP or MIU are in non-nominal modes)						İ		
bit 28: insufficient data for calibration (see below) bit 27: earth location data not available (see below)		1					1	
bit 26: first good time following a clock update (nominally 0)			l .					
bit 25: instrument status changed with this scan	1							
bits 24 - 5: <zero fill=""></zero>					1	1		
bit 4: transmitter status change occurred (see note 2)				1				-
bit 3: AMSU sync error detected (NOAA) or <zero fill=""> (Metop)</zero>	1	1						
bit 2: AMSU minor frame error detected (NOAA) or <zero fill=""> (Metop)</zero>		1						
bit 1: AMSU major frame error detected (NOAA) or <zero fill=""> (Metop)</zero>								
bit 0: AMSU parity error detected (NOAA) or <zero fill=""> (Metop)</zero>	J		<u> </u>		1	<u> </u>	<u> </u>	

	Start	End	Data	Word	Number	Scale		
Field Name	Octet	Octet	Туре	Size	of Words	Factor	Units	Notes
can Line Quality Flags [Time Problem Code] (If a bit is on	29	29	u	1	1	0		, ,
=1), the statement is true. All bits off implies the scan time is								
s expected.)								
it 7: time field is bad but can probably be inferred from the previous								
ood time								
it 6: time field is bad and can't be inferred from the previous good		}						
me it 5: this record starts a sequence that is inconsistent with previous								
mes (i.e., there is a time discontinuity). This may be associated with a								
pacecraft clock update. (See bit 26, Quality Indicator Bit Field.)								
t 4: start of a sequence that apparently repeats scan times that have								
een previously accepted								
its 3-0: <zero fill=""></zero>		4 100			4 4 5 4			
Zero Fill>	30	1480	i	<u> </u>	1451	0		
EXTENDED TEST DATA PACKET								
Mode Code/PIE ID/Self-Test Code	1481	1481	u	1	1	0		
its 7-4: mode code (5=self test)								
it 3: PIE ID (0=PIE A; 1=PIE B)								
its 2-0: self-test code	1/02	1519			38			+
Jused (set to zero)				- 1				(6)
extended Test Data	1520			1	1247			1(9/
Zero Fill>	2767	2834	1	2	34	0		
DISCRETE TELEMETRY			l					1
Equivalent to digital B and analog housekeeping telemetry in								
ther instruments.								
Main Bus Select Status (indicate which main bus (A or B) is	2835	2835	u	1	1	0		
sed by the MHS)			l '					
(0V)=A bus (relay closed)								
(SV)=B bus (relay opened)	2026	2026			1			
MHS Survival Heater (NOAA: content defined at right) or	2836	2836	u	1	1	U		1
<zero fill=""> (Metop)</zero>			i			į		
=on =off		ł						
RF Converter Protect Disable (NOAA: content defined at right)	2837	2837	u	1	1			
T	2057	2057	"	•	^	ľ		
Zero Fill> (Metop)			İ					
=00								
=yes			İ					
MHS Power A (NOAA: content defined at right) or	2838	2838	u	1	1	0		
Zero Fill> (Metop)								
=on								1 1
=off								
MHS Power B (NOAA: content defined at right) or	2839	2839	ս	1	1	0		
Zero Fill> (Metop)		1						
=on								
=off		ļ						
Main Converter Protect Disable (NOAA: content defined at	2840	2840	u	1	1	0	1	
ight) or						ŀ		
Zero Fill> (Metop)								
=no						[
=yes	2041	2017			_	 _		
Survival Temperatures Word 1: Receiver temperature	2841	2846	u	2	3	1 0	counts	
Nord 1: Receiver temperature Nord 2: Electronics equipment temperature								
Vord 2: Electronics equipment temperature Vord 3: Scan mechanism temperature	l				I	l		

	Start	End	Data	Word	Number	Scale		Γ
Field Name	Octet	Octet	Туре	Size	of Words	Factor	Units	Notes
ransmitter Telemetry (NOAA: content defined below) or	2847	2864	u	2	9	0	counts	
Zero Fill> (Metop)								
Word 1: STX-1 status								
Word 2: STX-2 status	1	İ		1				
Word 3: STX-3 status	1			l				
Word 4: STX-4 status				ŀ				
Word 5: STX-1 power								
Word 6: STX-2 power	1							
Word 7: STX-3 power			1					
Word 8: SARR-A power			i					
Word 9: SARR-B power								<u> </u>
Discrete Telemetry Update Flags (If bit = 0, associated	2865	2868	u	1	4	0		
telemetry item is up-to-date. If bit = 1, associated telemetry		İ		1				
item was not updated during most recent telemetry cycle -						ł		1
possibly due to lost frame.)				l		İ	ave status	
bits 31-18: <zero fill=""></zero>								.2
bit 17: SARR-B power (NOAA) or <zero fill=""> (Metop)</zero>					i		ا المارد	b :4:
bit 16: SARR-A power (NOAA) or <zero fill=""> (Metop)</zero>		l			١,	l il	ave staxus	
bit 15: STX-3 power (NOAA) or <zero fill=""> (Metop)</zero>		1	, ا	DRR-	B & does	NOT .		1.7
bit 14: STX-2 power (NOAA) or <zero fill=""> (Metop)</zero>	1 .		he :	ייומק	A)			bit
bit 13: STX-1 power (NOAA) or <zero fill=""> (Metop)</zero>	الم لمار	μ			l '	l .	lave pour	
bit 12: STX-4 status (NOAA) or <zero fill=""> (Metop)</zero>	7 '				l. see	5 NOT	,	ľ
bit 11: STX-3 status (NOAA) or <zero fill=""> (Metop)</zero>				C1X-	H 00			l
bit 10: STX-2 status (NOAA) or <zero fill=""> (Metop)</zero>		v	ľ	٠,٠٠	ļ.			
bit 9: STX-1 status (NOAA) or <zero fill=""> (Metop)</zero>								1
bit 8: Scan mechanism temperature		1						1
bit 7: Electronics equipment temperature		1						
bit 6: Receiver temperature		İ			İ	1		Į.
bit 5: Main converter protect disable (NOAA) or <zero fill=""> (Metop)</zero>			1					ŀ
bit 4: MHS power B (NOAA) or <zero fill=""> (Metop)</zero>			1	[i		
bit 3: MHS power A (NOAA) or <zero fill=""> (Metop)</zero>				ļ				1
: 2: RF converter protect disable (NOAA) or <zero fill=""> (Metop)</zero>			1					
pit 1: MHS survival heater (NOAA) or <zero fill=""> (Metop)</zero>			1					1
bit 0: Main bus select status		<u> </u>	 	 	-	-	-	-
FILLER	 	<u> </u>	<u> </u>	ļ		ļ	ļ	↓
<zero fill=""></zero>	2869	3072	<u>i</u>	2	102	(<u> 1</u>	<u> </u>

Notes 1, 2,6

6.4 MHS 1b Data Record Format (Extended Memory Data Packet)

Field Name	1				Number of Words	Scale Factor	Units	Notes
SCAN LINE INFORMATION	OCIEL	Jeiel	TAbe	SIZE	01 11 01 03	r actor		140162
	- ,		 			<u> </u>		
Scan Line Number (cumulative, starting with 1)	1	2		Z	1	<u> </u>		
Scan Line Year (four digits, e.g., 2000)	3	4		2	1	0		
Scan Line Day of Year (e.g., 365)	5	6		2	1	0		
Satellite Clock Drift Delta	7	8	i	2	1	0	milliseconds	
Scan Line UTC Time of Day	9	12	u	4	1	0	milliseconds	
Scan Line Bit Field	13	14	u	2	1	0		
bit 15: satellite direction (0=northbound; 1=southbound) bit 14: clock drift correction (0=not corrected; 1=scan time corrected for clock drift) bits 13-0: <zero fill=""></zero>								
Major Frame Count (cumulative, starting with 1) (NOAA) or	15	16	u	2	1	0		
<pre><zero fill=""> (Metop)</zero></pre>	1.5				-			
Coarse MHS On-board Time (OBT) (time since last reset to zero)	17	20	u	4	1	"	seconds	
Fine MHS OBT (fraction of second since last increment of coarse MHS OBT. Resolution: 2 ⁻¹⁶ seconds; range: 0 - 65,535.)	21	22	u	2	1	0		
MHS Mode Flag 0=power-on ("empty" MHS science data) 1=warm-up ("empty" MHS science data) 2=standby ("empty" MHS science data) 3=scan (valid MHS science data) 4=fixed view (valid MHS science data, but instrument is viewing a fixed location) 5=self-test (test data) 6=safeing ("empty" MHS science data) 7=fault ("empty" MHS science data) 8-14= <understandard (memory="" (unknown="" 15="memory" data)="" data)<="" dump="" td=""><td>23</td><td>23</td><td>u</td><td>1</td><td>1</td><td>O</td><td></td><td></td></understandard>	23	23	u	1	1	O		
Zero Fill>	24	24	i	1	1			
QUALITY INDICATORS			-	 	1	— <u> </u>	' 	+
Quality Indicator Bit Field (if a bit is on (=1), the statement is	25	28	u	4	1	C		
bit 31: do not use scan for product generation bit 30: time sequence error detected within this scan (see below) bit 29: data gap precedes this scan (gap may be due to actual lost scans or scans in which the TIP or MIU are in non-nominal modes) bit 28: insufficient data for calibration (see below) bit 27: earth location data not available (see below) bit 26: first good time following a clock update (nominally 0) bit 25: instrument status changed with this scan bits 24 - 5: <zero fill=""> bit 4: transmitter status change occurred (see note 2) bit 3: AMSU sync error detected (NOAA) or <zero fill=""> (Metop) bit 2: AMSU minor frame error detected (NOAA) or <zero fill=""> (Metop) bit 1: AMSU major frame error detected (NOAA) or <zero fill=""> (Metop) bit 0: AMSU parity error detected (NOAA) or <zero fill=""> (Metop)</zero></zero></zero></zero></zero>								

	Start	End	Data	Word	Number	Scale		
Field Name	Octet				of Words		Units	Notes
Scan Line Quality Flags [Time Problem Code] (If a bit is on	29	29	u	1	1	1	Chito	-1010
$\stackrel{\text{def}}{=} 1$), the statement is true. All bits off implies the scan time is	27	7		•	•	٦		
as expected.)								1
bit 7: time field is bad but can probably be inferred from the previous								
good time] [
bit 6: time field is bad and can't be inferred from the previous good								i i
time								
bit 5: this record starts a sequence that is inconsistent with previous								
times (i.e., there is a time discontinuity). This may be associated with a								
spacecraft clock update. (See bit 26, Quality Indicator Bit Field.) bit 4: start of a sequence that apparently repeats scan times that have	<u> </u>							
been previously accepted								
bits 3-0: <zero fill=""></zero>								
<zero fill=""></zero>	30	1480	i	1	1451	0		
EXTENDED MEMORY DATA PACKET								
Packet ID/PIE ID	1481	1481	u	1	1	Q		
bits 7-4: packet ID (15=memory data packet)								j l
bit 3: PIE ID (0=PIE A; 1=PIE B)	!]			1
bits 2-0: unused (undefined)	1400	1 40 4		1	2	0		7
Start Address (where, word 1 is the most significant byte of	1482	1484	u	1	د	l 4		'
address and word 3 is the least significant byte)	1405	0500			513			1 7
Data Words	1485			2				7
<zero fill=""></zero>	2509	2834	<u>i</u>	2	163	0		
DISCRETE TELEMETRY								1
Equivalent to digital B and analog housekeeping telemetry in						į		
other instruments.	ļ							
Main Bus Select Status (indicate which main bus (A or B) is	2835	2835	u	1	1	0		
used by the MHS)						1		
(0V)=A bus (relay closed)								
(5V)=B bus (relay opened)	2836	2836	u	-	1	1 0		†
MHS Survival Heater (NOAA: content defined at right) or	2030	2030	1 "	'		1		
<zero fill=""> (Metop)</zero>	İ			1				k
1=on 0=off		l						
RF Converter Protect Disable (NOAA: content defined at right)	2837	2837	u	1	1	0		
or						•		
<pre><zero fill=""> (Metop)</zero></pre>	İ	l	ļ	İ		ĺ		
1=no								
0=yes	<u> </u>		<u> </u>					
MHS Power A (NOAA: content defined at right) or	2838	2838	u	1	l 1	.j 0		
<zero fill=""> (Metop)</zero>	1							1
1=on								
0=off	2020	2026	 	 	<u> </u>	0		-
MHS Power B (NOAA: content defined at right) or	2839	2839	u	'	l '	4 '	1	
<zero fill=""> (Metop)</zero>								
1=on 0-off					1			
0=off Main Converter Protect Disable (NOAA: content defined at	2840	2840	u	<u> </u>	<u> </u>	i c		
right) or	20.70	"] "	'] '] `		
⟨Zero Fill> (Metop)				1				
1=no					1		1	1
0=yes		L						<u> </u>
Survival Temperatures	2841	2840	5 u		2 :	3 0	counts	
Word 1: Receiver temperature				1				
Word 2: Electronics equipment temperature	1		1				1	
Word 3: Scan mechanism temperature	1	L	1		J	<u> </u>	L	

	Start	End	Data	Word	Number	Scale	T	
Field Name				l .	of Words		Units	Notes
Transmitter Telemetry (NOAA: content defined below) or	2847			2	9		counts	.1
<zero fill=""> (Metop)</zero>					1			,
Word 1: STX-1 status					ļ]		
Word 2: STX-2 status					İ			
Word 3: STX-3 status								
Word 4: STX-4 status						İ	ŀ	
Word 5: STX-1 power								
Word 6: STX-2 power						l	i	
Word 7: STX-3 power						ŀ		1 1
Word 8: SARR-A power]			
Word 9: SARR-B power								
Discrete Telemetry Update Flags (If bit = 0, associated	2865	2868	u	1	4	Ó		
telemetry item is up-to-date. If bit = 1, associated telemetry								1 1
item was not updated during most recent telemetry cycle -		İ			l			
possibly due to lost frame.)								1 1
bits 31-18: <zero fill=""></zero>					1			
bit 17: SARR-B power (NOAA) or <zero fill=""> (Metop)</zero>						ł		
bit 16: SARR-A power (NOAA) or <zero fill=""> (Metop)</zero>								1
bit 15: STX-3 power (NOAA) or <zero fill=""> (Metop)</zero>								
bit 14: STX-2 power (NOAA) or <zero fill=""> (Metop)</zero>								
bit 13: STX-1 power (NOAA) or <zero fill=""> (Metop)</zero>			i					
bit 12: STX-4 status (NOAA) or <zero fill=""> (Metop)</zero>								
bit 11: STX-3 status (NOAA) or <zero fill=""> (Metop)</zero>						į	1	
bit 10: STX-2 status (NOAA) or <zero fill=""> (Metop)</zero>			ļ					1
bit 9: STX-1 status (NOAA) or <zero fill=""> (Metop)</zero>						•	[
bit 8: Scan mechanism temperature								
bit 7: Electronics equipment temperature								
bit 6: Receiver temperature					i			
bit 5: Main converter protect disable (NOAA) or <zero fill=""> (Metop)</zero>								
bit 4: MHS power B (NOAA) or <zero fill=""> (Metop)</zero>							ł	
bit 3: MHS power A (NOAA) or <zero fill=""> (Metop)</zero>							İ	
bit 2: RF converter protect disable (NOAA) or <zero fill=""> (Metop)</zero>								,
bit 1: MHS survival heater (NOAA) or <zero fill=""> (Metop)</zero>								
bit 0: Main bus select status								<u> </u>
FILLER FILLER						L		
<zero fill=""></zero>	2869	3072	i	2	102	0		

Notes, 12,7

6.5 MHS 1b Data Record Format ("Unknown" Packet)

	Start				Number	Scale		
Field Name	Octet	Octet	Type	Size	of Words	Factor	Units	Notes
SCAN LINE INFORMATION								
Scan Line Number (cumulative, starting with 1)	1	2	u	2	1	0		
Scan Line Year (four digits, e.g., 2000)	3	4	u	2	1	0		
Scan Line Day of Year (e.g., 365)	5	6	u	2	1	0		
Satellite Clock Drift Delta	7	8	i	2	1	0	milliseconds	
Scan Line UTC Time of Day	9	12	u	4	1	0	milliseconds	
Scan Line Bit Field	13			2	1	0		<u> </u>
bit 15: satellite direction (0=northbound; 1=southbound)		•	_	1 -	1 -			
bit 14: clock drift correction (0=not corrected; 1=scan time corrected								
for clock drift)	1							
bits 13-0: <zero fill=""></zero>								
Major Frame Count (cumulative, starting with 1) (NOAA) or	15	16	u	2	1	0		
<zero fill=""> (Metop)</zero>					}			<u> </u>
Coarse MHS On-board Time (OBT) (time since last reset to	17	20	u	4	1	C	seconds	
zero)								
Fine MHS OBT (fraction of second since last increment of	21	22	u	2	1	0		
coarse MHS OBT. Resolution: 2 ⁻¹⁶ seconds; range: 0 -			_	-	1			
65,535.)					l			
MHS Mode Flag	23	23	u	1	1	-		
0=power-on ("empty" MHS science data)	23	23	"	'	1 .	\ \ \	1	
1=warm-up ("empty" MHS science data)	1							
2=standby ("empty" MHS science data)			ŀ					
3=scan (valid MHS science data)								
4=fixed view (valid MHS science data, but instrument is viewing a fixed							ŀ	
cation)			1					
5=self-test (test data)								
6=safeing ("empty" MHS science data)		i						
7=fault ("empty" MHS science data) 8-14= <undefined> (unknown data)</undefined>	İ	l		ļ				
15=memory dump (memory dump data)		ĺ	1	1		1		
Zero Fill>	24	24	i	1	1		 	
QUALITY INDICATORS		-		<u> </u>				
Quality Indicator Bit Field (if a bit is on (=1), the statement is	25	28	u	 	d		\	
	23	20	1 "	_	1 '	Ί `	1	
true)	ļ							
bit 31: do not use scan for product generation bit 30: time sequence error detected within this scan (see below)		i				1		İ
bit 29: data gap precedes this scan (gap may be due to actual lost			l					
scans or scans in which the TIP or MIU are in non-nominal modes)					İ			
bit 28: insufficient data for calibration (see below)		1						1
bit 27: earth location data not available (see below)			l					
bit 26: first good time following a clock update (nominally 0)								
bit 25: instrument status changed with this scan						1		
bits 24 - 5: <zero fill=""></zero>								
bit 4: transmitter status change occurred (see note 2) bit 3: AMSU sync error detected (NOAA) or <zero fill=""> (Metop)</zero>		1			Ī			
bit 2: AMSU minor frame error detected (NOAA) or <zero fill=""> (Metop)</zero>		1						
bit 1: AMSU major frame error detected (NOAA) or <zero fill=""> (Metop)</zero>		1				1		1
bit 0: AMSU parity error detected (NOAA) or <zero fill=""> (Metop)</zero>	<u> </u>		L			<u> </u>		

	Start	End	Data	Word	Number	Scale		
Field Name					of Words		Units	Notes
Scan Line Quality Flags [Time Problem Code] (If a bit is on	29			1	1	0		
(=1), the statement is true. All bits off implies the scan time is								
as expected.)								
bit 7: time field is bad but can probably be inferred from the previous								1 1
good time								1 1
bit 6: time field is bad and can't be inferred from the previous good time								
bit 5: this record starts a sequence that is inconsistent with previous								
times (i.e., there is a time discontinuity). This may be associated with a	1							1 1
spacecraft clock update. (See bit 26, Quality Indicator Bit Field.)	1							
bit 4: start of a sequence that apparently repeats scan times that have been previously accepted	1							
bits 3-0: <zero fill=""></zero>								
<zero fill=""></zero>	30	1480	i	1	1451	0		
UNKNOWN PACKET DATA								
Packet Data	1481	2766	u	1	1286	0		8
<zero fill=""></zero>	2767	2834	i	2	34	0		
DISCRETE TELEMETRY								1
Equivalent to digital B and analog housekeeping telemetry in								
other instruments.								
Main Bus Select Status (indicate which main bus (A or B) is	2835	2835	u	1	1	0	,	
used by the MHS)							1	
1 (OV)=A bus (relay closed)				l				
0 (5V)=8 bus (relay opened)	2836	2836		1	1			+
MHS Survival Heater (NOAA: content defined at right) or <zero fill=""> (Metop)</zero>	2830	2030	u	,	1	4		
1=on								
0=off		<u> </u>						
RF Converter Protect Disable (NOAA: content defined at right)	2837	2837	u	1	. 1	0		
or								
<zero fill=""> (Metop)</zero>			1					
1=no								
0=yes MHS Power A (NOAA: content defined at right) or	2838	2838	u	1	1			+
Zero Fill> (Metop)	2030	2030	"	١ '	1	l '		1
1=on				l				
0=off								
MHS Power B (NOAA: content defined at right) or	2839	2839	u	1	1	0		
<zero fill=""> (Metop)</zero>	l							
1=on								
0=off Main Convertor Protect Disable 0/044 and 4 disable 1	2040	2040		ļ				
Main Converter Protect Disable (NOAA: content defined at right) or	2840	2840	u		1	l o		} }
<pre><zero fill=""> (Metop)</zero></pre>								
1=no								Ì
0=yes								
Survival Temperatures	2841	2846	u	2	3	0	counts	
Word 1: Receiver temperature								
Word 2: Electronics equipment temperature Word 3: Scan mechanism temperature						1		1
Transmitter Telemetry (NOAA: content defined below) or	2847	2864	u	-		0	counts	1
<zero fill=""> (Metop)</zero>	2017	200	"	1 1	1 1]	Counts	
Word 1: STX-1 status								
Word 2: STX-2 status				-				
Word 4: STX-3 status								
Word 4: STX-4 status Word 5: STX-1 power								
Word 6: STX-2 power		1						
Word 7: STX-3 power		1						
Word 8: SARR-A power		1						
Word 9: SARR-B power	<u> </u>				<u> </u>	1		

	Start	End	Data	Word	Number	Scale		
Field Name	Octet	Octet	Type	Size	of Words	Factor	Units	Notes
Discrete Telemetry Update Flags (If bit = 0, associated	2865	2868	u	1	4	0		
elemetry item is up-to-date. If bit = 1, associated telemetry								
item was not updated during most recent telemetry cycle -								
possibly due to lost frame.)		1						
bits 31-18: <zero fill=""></zero>				ŀ				
bit 17: SARR-B power (NOAA) or <zero fill=""> (Metop)</zero>	1	!	}	\	I			\
bit 16: SARR-A power (NOAA) or <zero fill=""> (Metop)</zero>						ľ		
bit 15: STX-3 power (NOAA) or <zero fill=""> (Metop)</zero>			ŀ					1
bit 14: STX-2 power (NOAA) or <zero fill=""> (Metop)</zero>								
bit 13: STX-1 power (NOAA) or <zero fill=""> (Metop)</zero>								
bit 12: STX-4 status (NOAA) or <zero fill=""> (Metop) bit 11: STX-3 status (NOAA) or <zero fill=""> (Metop)</zero></zero>						i		ļ
bit 10: STX-2 status (NOAA) or <zero fill=""> (Metop)</zero>								
bit 9: STX-1 status (NOAA) or <zero fill=""> (Metop)</zero>								
bit 8: Scan mechanism temperature								
bit 7: Electronics equipment temperature	1		ļ					
bit 6: Receiver temperature								
bit 5: Main converter protect disable (NOAA) or <zero fill=""> (Metop)</zero>								
bit 4: MHS power B (NOAA) or <zero fill=""> (Metop)</zero>		ļ						
bit 3: MHS power A (NOAA) or <zero fill=""> (Metop)</zero>	1	i	1	l	\	l	}	1
bit 2: RF converter protect disable (NOAA) or <zero fill=""> (Metop)</zero>	1		Į.	ĺ				
bit 1: MHS survival heater (NOAA) or <zero fill=""> (Metop)</zero>		ł		ļ		•		
bit 0: Main bus select status		 	-	 		├		+
FILLER	1		 	 			 	+
<zero fill=""></zero>	2869	3072	1	1 . 2	2 102	4 (<u> </u>	

Notes 12,8

7 TBCs/TBDs

- TBC1: The values of the "Spacecraft Identification Code" field in the header record for the Metop satellites, and their origin.
- TBD1: The content and format of the secondary header record.
- TBD2: The necessity of bias correction data, including transmitter telemetry, for the Metop satellites (and the NOAA satellites, for that matter).
- TBD3: The unit of measure, scale factor, and content of the "Change in Spacecraft Velocity" field in the header record.
- TBD4: The unit of measure and scale factor of the "Spacecraft Mass" field in the header record.

78 Notes

- 1)1. The MHS 1b will not contain any MIU-related analog or digital B telemetry items from the NOAA data stream. These items will be archived in a separate NOAA telemetry file.
- 2. The RFI/bias correction data is based on experience with the AMSU-B instrument from the NOAA-KLM series of satellites. While it may not be necessary, it is being left in the MHS 1b format. Until a determination is made that it is necessary, it will be zero filled.
- 3. To determine the word location and bit location within the word of a particular FOV's validity flag, use the following equations: word = truncate((FOV - 1) / 8) + 1

word = truncate(
$$(FOV - 1)/8$$
) + bit = $(FOV - 1) \mod 8$

For example, FOV 64's validity flag is located in bit 7 of word 8, computed as follows: word = truncate(
$$(64 - 1) / 8$$
) + 1 = truncate($(63 / 8) + 1$ = truncate($(7.875) + 1 = 7 + 1 = 8$ bit = $(64 - 1)$ mod $8 = 63$ mod $8 = 7$

- 4)4. The limits are defined in the Telemetry Limits Table, which is loaded into the instrument's memory. This table can be found in Appendix B of AD-1, and in Table 3.2.2.2.9-3 of AD-2. There are two levels of limits: "warning" limits and "fault" limits. If a telemetry item goes outside of the "warning" limits, then this bit is set. If the telemetry item goes outside of the "fault" limits, then an error flag is raised in the "fault code" field and the instrument switches to "fault" mode.
- 5)5. This bit is related to the Earth/Space/OBCT View Position Validity Flags. It is set by the instrument and comes in the data stream. The Position Validity Flags are set by the preprocessor. If this bit is set, then at least one bit of the Position Validity Flags should be set also.
- 6)6. Refer to Section 4.3.2.3 of AD-1 for a detailed description of the content of this field.
- 7. Refer to Section 4.3.2.2 of AD-1 for a detailed description of the content of this field.

8. The mode of the instrument--and therefore the type of packet--is unknown if the mode code in the data stream is either missing (due to a missing minor frame, for example) or corrupt (i.e., set to one of the "unused" values). In the event of an unknown mode/packet, the packet data is placed into this field without modification."

89 Acronyms

ADC	Analog-to-Digital Converter
AMSU	Advanced Microwave Sounding Unit
AELDS	Advanced Earth Location System
AIP	AMSU Instrument Processor
AU	Astronomical Unit
CCSDS	Consultative Committee for Space Data Systems
cm	centimeter
CPIDS	Calibration Parameters Input Data Set
dB	Decibel
DC	(1) Direct Current; (2) Down Converter (part of Rx)
EE	Electronics Equipment
EM	Engineering Model
FDM	Flywheel Drive Mechanism/Module (part of SM)
FM	Flight Model
FOV	Field Of View
GAC	Global Area Coverage
HRPT	High Resolution Picture Transmission
IF	Intermediate Frequency
IJPS	Initial Joint Polar-orbiting Operational Satellite System
K	Kelvin
km	kilometer
LAC	Local Area Coverage
LNA	Low Noise Amplifiers (part of Rx)
LO	Local Oscillator; also known as QBS (part of Rx)
m	(1) meter; (2) milli-
Metop	Meteorological Operational Satellite
MHS	Microwave Humidity Sounder
MIU	MHS Interface Unit
MUX	Multiplexer
NOAA	National Oceanic and Atmospheric Administration
OBCT	On-Board Calibration Target
OBT	On-Board Time
PACS	Polar Acquisition and Control Subsystem
PFM	Proto-Flight Model
PIE	Processor and Interface Electronics
PROM	Programmable Read Only Memory
PRT	Platinum Resistance Thermometer
PSU	Power Supply Unit
QBS	Q-band Source (part of Rx)
RDM	Reflector Drive Mechanism/Module (part of SM)
REF CK	Reference Clock

RF	Radio Frequency
RFI	RF Interference
Rx CV	Receiver Converter
SAIP	Stored AIP
SARR	Search and Rescue Repeater
SCE	Scan Control Electronics (part of EE)
SM	Scan Mechanism
SOCC	Satellite Operations Control Center
SPE	Signal Processing Electronics (part of EE)
sr	steradian
SSHM	Scan Sensor Head Module (part of SM)
STIP	Stored TIP
STX	S-band Transmitter
TBC	To Be Confirmed
TBD	To Be Determined
TC	Telecommand
TIP	TIROS Information Processor
UTC	Universal Time Coordinated
V	Volts
W	Watts
YGC	Yaw Gyrocompassing